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BIRDS.

To the ordinary individual in British Guiana, the man who lives in a town and probably works in an office, also (and sad to relate) he who lives in the country and tills the soil thereof as a means of livelihood, birds mean little else than creatures with feathers and powers of flight; are capable, at times, of despoiling certain crops and only of any real interest or use when cooked and ready to be eaten. Such knowledge may be correct but it is surely misleading. It should be universally known that many birds are of extraordinary utility to the farmer, for without them it would speedily become impossible to produce crops owing to the hordes of destructive insects which, in the absence of their enemies the birds would appear.

The vicious persecution of a number of species of useful birds by small boys (and not infrequently big boys) armed with sling shot, guns, stones and even sticks (not to mention cheap guns) should be rigorously put down.

The practice of snaring birds for sale is not only cruel but it also tends to destroy a number of useful birds. The Ordinance for the protection of wild birds has lately been revised in certain details which are reproduced in this Number. A careful study of the two "Schedules" should be made by every conscientious agriculturist in British Guiana. Most colonists know and appreciate the beauties of the Georgetown Botanic Gardens, but few realize the wealth of bird life which, owing to absolute protection, exists there and which Mr. Cleare in his article so well describes from his intimate knowledge thereof.

BIRD LIFE IN THE BOTANIC GARDENS.

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Forty years ago there was a large swampy area of some two hundred acres on the outskirts of Georgetown, part of the old plantation of Vlissingen that had gone out of cultivation quite another forty years before. Coffee no longer grew there, "It was a huge morass, intersected by deep canals and chocked up drains, lying more or less under water the greater part of the year."* The great house, too, ceased to exist; all that remained was an avenue of magnificent Oronoque trees, evidence of the former middle walk, although even these had been taken over by ephiphytal and parasitic growths. Such was the site chosen for the new gardens, and "rarely has it happened in the history of the art of horticulture that a situation chosen for a garden has required preparations of the magnitude which this demanded to bring it into even a moderately satisfactory state. . . . The work, too, was of a most difficult and laborious nature. There were no high places which might be made low at little expense and trouble; for every hole filled a hole of corresponding capacity had to be dug; and every foot the surface was raised was lifted from a lower level, and from a greater or less distance from where the material was required."*

Forty years have past, and to-day in place of that abandoned area stand the Botanic Gardens of British Guiana. Some of the Oronoque trees are still there, though one by one they are falling into decay, and between them runs the Central Avenue, a worthy successor to the middle walk; but in place of the swampy pasture is a magnificent tropical garden.

* Jenman, G.S., Report of the Government Botanist and Superintendent, Botanic

To the late George Samuel Jenman, F.L.S., the first Superintendent, and to his assistant Mr. John F. Waby, the credit of this transformation is due, and the Botanic Gardens of British Guiana, one of the finest tropical gardens in the world and possessing the best collection of living palms, will stand forever a living memorial to those gentlemen.

Almost from its inception the Gardens have offered a home for the various forms of wild life in the vicinity of Georgetown, and even nowadays one of the most pleasing features of the gardens is the comparative abundance of such creatures. Salampentas and mongooses may usually be encountered, while water hass, labbas, and foxes are at least occasional visitors. In the numerous lakes and trenches alligators are frequent. Three manatees and several turtles of different species have been introduced, which not only add to the interest, but serve a useful purpose in keeping down the vegetation that would otherwise soon take over these waters.

Birds are perhaps the most noticeable form of animal life in the gardens for from tiny humming birds, hardly more than a couple of inches long, to large hawks, well over twenty inches, all make their homes in the gardens.

Probably the first birds that attract one's attention are the ubiquitous and noisy Kiskadees, for there seems to be always at least one of the numerous kinds within sight while their cries may always be heard. If it is not the common *Pitangus sulphuratus* it is probably his small cousin *P. lictor*, or one of the other members of the family, either the grey-breasted kiskadee, the little pigmy 'pipitoori,' or perhaps a 'muff bird.'

As abundant as the Kiskadees are the little Wrens or 'God birds' as they are called locally, which are abundant and frequent all parts of the gardens, their cheery notes being heard whenever one goes.

The different kinds of Sackis or Tanagers are also numerous and of these the beautiful, rich, wine-coloured

Cashew Sacki is the most frequently seen, its white lower beak at once distinguishing it, in fact it is often called 'Silver Beak.' The Palm Sacki is also of fairly common occurrence, while the vindictive notes of the 'Tom Pitcher'—"If you trouble me I shall pick you" can often be heard. The most beautiful of the garden tanagers, however, is the Yellow-vented Tanager, with its metallic blue and black colouring; unfortunately it is only occasionally seen. Happily the handsome Blue Sacki—our Blue Bird—is quite abundant. It is a beautiful bird, of a fine cobalt blue colour with the large wing feathers indigo. When the mangoe trees are in fruit all these tanagers are abundant, and their shrill notes—for they can hardly be called a song—are familiar sounds.

Thrushes, too, are numerous and may invariably be seen on the lawns of the ornamental section busily searching for insects.

It is in the parklands that the largest number and greatest variety of birds are to be found. There both the large and small Old Witches are of common occurrence, and may usually be seen hunting around the grass for insects, or scrambling over the branches of the Saman trees eagerly devouring the beautiful little shell-pink insect *Poekilloptera phalenoides*, which, in spite of its name, thrives and is a veritable pest on these trees. The large old witches also have a habit of collecting in numbers in the shade and uttering a peculiar long-sustained rattling noise that is characteristic but quite indescribable.

It is here, too, that the Hawks are in greatest numbers, and it is the snail-eating Chima-chima that is commonest. It is by far the most abundant of the garden hawks, feeding, I believe, principally on the large snails that are so plentiful in the trenches and lakes. If one has a keen eye however, one may see, standing motionless on a branch well in the shade, other 'chicken hawks' and, occasionally, a large white-headed buzzard, one of the largest of our hawks and looking more like a small eagle.

This last species has a peculiar wail-like whistle which may often be heard about the gardens.

Woodpeckers may also be occasionally seen, and the most peculiar of these is the large red-crested "carpenter-bird". It is a handsome bird, black, with white markings, and a large flaming blood-red-'toorie', which appears to fall off every time the bird pecks, only to reappear when it comes to a standstill.

The harsh discordant voices of a flock of Hahn's macaws, which are now constant visitors, may often be heard issuing from the tops of the tall 'cock trees,' varied at times by the rather more screechy notes of some Brown-throated Parrakeets.

One of the familiar sounds of the gardens is a peculiar call, loud, and descending in a sort of chromatic scale, kik-kik-kik-kik-kao, which may often be heard issuing from some low bush. If one looks carefully one may detect its origin; a small bird, about 6 inches long, closely barred with black and white, somewhat after the manner of a Plymouth Rock fowl. Almost for certain there will come an answering call, and in a while his mate will arrive. As different as chalk is from cheese, so is this bird and his wife, for she is of a rich red-brown colour only her face being barred as in the male.

Another sound that is frequently heard in the gardens is an eerie whistle, pi——pi—— It is the call of the 'Wife Sick.' The plaintive notes may often be heard in the less frequented parts, but it is only occasionally that one sees the bird itself. If one is lucky one may see him hunting among the grass, often under the Saman trees, for insects. His shape will at once place him among the cuckoos, for in a general way he is somewhat the shape of an old witch. His colouring however is quite different, a brownish colour marked here and there with lighter feathers. When making his call he spreads his wings slightly, erects the feathers on the top of his head and gives forth the mornful notes. He can

easily be fooled and I remember one occasion when, to get a better veiw of him, I imitated his call, with the result that he soon was perching within a few feet of me, decidedly puzzled.

During the hottest period of the day, when the rays of the sun seem to pour down with all their force, when the majority of the birds seek places in the shade to hide and when man himself is feeling drowsy, there may usually be heard a peculiar call, restful and sleepy, it seems to express one's very feelings ; it is the coo of the "Barbary Dove", and tripping adown the path in a truly feminine fashion, one may see a couple of these dainty little birds. About the paths of the gardens there may also be seen Ground Doves—small birds, about four inches long. They usually go in pairs hunting for grass and other weed seeds, and are among the tamest birds in the gardens.

At times flocks of 'Robins' may be seen about the parklands, the striking scarlet-breasted males invariably doing 'stunts' for the admiration of the opposite sex which outnumber him in proportions of something like twenty to one

Another bird that is constantly 'stunting' is the little shining black 'Beezing' grass bird. This little fellow may often be seen perched on some shrub, and if he is kept in view for a little time, he will invariably be caught at his antics. Suddenly he will rise almost perpendicularly from his perch for about twelve or eighteen inches, then, with a sort of half somersault, land almost on the exact spot from which he rose, at the same time uttering the notes from which he gets his creole name—"Beezing."

Flocks of 'grass birds' may at times be seen about the lawns and parklands feeding on grass and other weed seeds, the commonest being the little 'blue back' The female of all these grass birds are of a brownish colour and cannot be easily distinguished apart, but a male can always

be found among the flock and can at once be recognised by its conspicuous colouring.

A constant visitor during its season is the migrant American yellow-billed cuckoo, or "foolish bird" as it is often called here, while the American Golden Warbler—our "Peas-tree Canary"—can invariably be expected about September, remaining during the latter months of the year though a few are to be seen all the year round.

One of the earliest undertakings in the gardens was the digging of a number of Lakes. The main purpose for doing this was to obtain the necessary earth for filling up the trenches and levelling, and in the process the Islands were formed. Mr Henry Prestoe, the then Government Botanist of Trinidad, who designed our gardens, pointed out at that time that these islands would afford excellent breeding grounds for many kinds of water-fowl and in this way offer an additional attraction.

As far back as 1887, only seven years after the formation of the gardens, birds began to establish themselves on the lakes and we have Mr. Jenman, in his annual report for that year, writing as follows:—

"A very pleasing feature of the lakes has been the large number of water birds which during the past year for the first time, has taken up quarters by day in and about them. Of the several kinds the spurwings were far the most abundant, and all day long large flocks of them were to be seen running over the lily leaves on the water or on the bank and sward outside. But the variety of birds that inhabit constantly, or that visit periodically, the gardens is constantly and very markedly increasing from year to year, and I frequently observe species that I have never seen before. Some of them are possibly migratory but others stay permanently."

The actual breeding of birds on these islands did not apparently occur till the following year (1888) and in his report for that year Mr. Jenman writes.

"The protection afforded the birds has largely increased their numbers of late years, as I have before noted, and every season I detect additional members among their numbers. Two of three kinds of cranes have been among the permanent visitors, especially plentiful during the dry season, of the past year, blue hens have been frequent; Spurwings and Herons have bred on the islands of the lakes; Teal ducks have paid occasional visits, as have also Curlew and other aquatic birds."

In connection with the breeding of the Spurwings the following note appears in the Demerara 'Argosy' of December 8, 1888, under the head of "Garden, Field, and Forest," a column contributed by Mr. Jenman for several years.

"The Spurwings, *Parra jacana*, which were so plentiful on the lakes of the Botanic Gardens during the winter, left in the spring for their breeding grounds in the savannahs some few miles inland. They have again returned during the past two or three months, but are not yet so plentiful as they were before their departure. One pair out of their number remained here, and reared a brood of chicks."

Of all the bird haunts in the gardens to-day the islands on the lakes are the most favourite spots, and this is especially true of the ones to which the public do not have access. All sorts of water birds frequent these islands—Gauldings, Quacks, Chows, Spurwings, Blue hens, etc., in fact one of the sights of the gardens is the white gauldings—the young of the Blue Gaulding—which may be seen during the greater part of the year perched on the trees, against which they are very conspicuous and contrast so beautifully. Quacks may also be seen there during the day, sleepily awaiting the hours of darkness to go forth on their raids. Spurwings, and Blue hens too, may invariably be seen hurrying across the huge *Victoria Regia* lily leaves, often followed by a couple of chicks,

while Chows, with their shoulders almost touching their ears, wait on the banks, immovable as a stone, for some unsuspecting fish.

To learn of the life of these birds one must visit the islands, and there, among the tangled mass of vegetation and thorns, find their nests, eggs, and babies. Last June I visited these islands to study the gauldings, the breeding season was then at its height and there were literally hundreds of birds present.

The lakes teemed with so many interesting things that it was difficult to keep to one's subject. To begin with were the gigantic native *Victoria Regia* lilies, with their huge leaves often measuring some six feet in diameter and almost covering the water in places. In the early morning when the flowers were open they afforded a truly majestic sight, hard to surpass. Among the insects, dragon-flies were common, darting back and forth across the water, while in places where the aquatic plant *Salvinia* was thick, hundreds of small grasshoppers were present, jumping from place to place as the boat made its way through the vegetation.

I should be omitting one of the characteristics of the lakes if I did not mention the alligators, for here they abound. If one approaches stealthily, and keeps a watchful eye, one may usually detect, hidden amongst the lilies and weeds, one or more of these evil-eyed creatures. On one of the islands I found an alligator's nest. It was situated at the base of a clump of palms and bamboos and was composed chiefly of semi-decayed bamboo leaves, being about two feet high and four feet in diameter. The first six inches or so was of material recently collected, but below this it was fairly well rotted and about halfway down the eggs were found, thirty in number.

As I approached the islands loud quackings and croakings could be heard on all sides, as the adult and older birds, principally gauldings, made off to the adjacent

islands and surrounding 'bush.' The younger birds, those unable to fly or at best but feebly, made their way into the thick vegetation and in a short time but few birds were to be seen. In their efforts to escape the young birds freely used their necks and wings to obtain a hold and assist locomotion, though they depended chiefly on their feet. Birds could thus frequently be seen, their feet grasping one branch, their necks and heads hooked over another, and making violent efforts to secure a hold with their wings, in which they were often successful. Still younger birds would either walk as far as possible along the limb from their nest, or merely stand there motionless in an attitude of intense fear.

The vegetation on these islands is dense and of a very mixed character. About the centre are large trees such as "Long John" and Wild Cacao which stand well above the other growth, forming ideal resting places for the "chicken hawks" as they wait to swoop down on young gauldings. Near the water's-edge grow "bread and cheese," bamboos, "wait-a-bit pimplers" and numerous other wild plants, their branches well overhanging the water, while in the water itself is the giant aroid "mucca-mucca."

Amongst the pimplers and mucca-mucca, invariably overhanging the water, sometimes but a few inches off the surface at other times quite ten feet up, but usually between two and five feet; such were the positions in which the gauldings made their nests. The nests themselves were practically only platforms of dried sticks, most untidy looking affairs, with the centre slightly pressed down thus forming a shallow cavity in which the eggs rested. Two or three smooth, glazeless, eggs are laid, pale blue-green in colour, elliptical in shape, and about $1\frac{1}{3}$ inches long by 1 inch broad.

In June all stages of young birds were present, from those only just hatched to others in heavy white plumage that had already left the nest but were still incapable of sustained flight. In the early stages the down was thin and scanty, but after a short time feathers began to ap-

pear and the young birds were soon a snowy white. They usually remained quite still in their nests, but when disturbed, in my efforts to take their pictures would often pick at my hand, and, in the older stages, leave the nest, and scramble away among the vegetation.

After the birds had grown big enough to leave their nests they did not go far from it, but could be seen perched on the surrounding bush or hunting among the lilies for fish.

One of the peculiarities of Blue Gauldings is that their young are white, and they retain this plumage for a considerable time—something like a year—after leaving the nest; yet while carrying out these investigations I came across several nests containing *blue* nestlings. I must admit I was considerably puzzled; but eventually the mystery was unravelled, and I discovered that they were the young of the Tricoloured Heron, which were also nesting on the islands. As far as I know this was the first record of these birds from the gardens, but they may now always be seen there, as well as about the trenches in the vicinity of the Sea Wall and Georgetown. The adults are readily distinguished from the blue gauldings by the white underside (termed, vent) they possess, which is easily seen, while the plumage of the nestlings is also characteristic; but, except for a slight difference in the size, the eggs of the two species are identical.

Spurwings or Jacanas, as already shown, were among the earliest inhabitants of the lakes and are now quite abundant about the gardens as well as the coastlands. They are interesting birds in many ways. Their colouration is peculiar and pretty. The head, neck, and breast, down to the vent, is black, the back and wing-covers are a reddish-brown, while the large wing feathers are a pale greenish-yellow edged and tipped with black; there is hardly any distinct tail. Their legs are long, and their toes particularly so, enabling them to walk with great speed and ease over the lily leaves. In flight the legs are extended behind, tail-like, equal to the length of the body. Another

peculiarity of these birds is the fleshy shield of an orange-red colour which extends up over the forehead, covering the feathers but quite free, while below this, at the base of the bill, are a pair of auricles, one on each side, of the same character. It has been suggested that the use of these appendages is as a protection to the head of the birds when they plunge their bills into soft mud after their prey. On their shoulders are a pair of sharp yellow spurs, which may be seen as the birds alight and from which they derive their creole name.

Mr. Jenman in Garden, Field, and Forest for October 26, 1889, gives the following interesting description of the nest of these birds.

"While watching one of these broods (young "spurwings) a short time ago, in the company of a "friend, I detected a nest three or four yards from the "bank with three eggs on, rather than in, it. The "parent birds were not present at the time, having, as "I afterwards found, flown away on our approach to that "part of the lake. The next day, on my revisiting the "spot, the birds were found to be absent again, having "again heard my approach, but by concealing myself in "some bushes, in a situation from which the nest could "be observed, I was able to determine satisfactorily what "birds were the owners, and that to a pair of spurwings "it belonged. After a short time the female cautiously "returned, stealthily watching and looking about to "make sure that she was not observed; and at length "with much hesitation and much peering around, she "took up her position on the nest; at first simply "straddling her legs over it, but finally, as her perturba-"tion of mind passed off, settling slowly down on the "eggs. The nest of the spurwing I have not seen "described before, but it is probable that other material "than the plant here mentioned is often used in its "construction, if such a term may be used for such a "nest in any but the most conventional sense. The nest "in question was of the roughest description, composed of "about a double handful of one of the small floating

"pond-weeds (*Salvinia*) still alive and perfectly fresh, "loosely drawn together in a small heap, with little if "any arrangement, on the surface of a Victoria leaf, and "entirely unconcealed ; the three eggs, which appeared "to be of a spotted or streaked colour, and about the size "of a Thrush or Blackbird's egg, lay on the top of the "little cone of wet weeds. . . . On the third morning "of my visits the chicks were out of the shells and "walking about, though they had not ventured off the "*Victoria* leaf, on which the nest—now scattered about "by the parents' feet—had been made. The mother, "when undisturbed was seen occupied in brooding over "them and endeavouring to keep them together and as "near to her as possible. At this time they were, for "birds running about, most tiny little creatures, not "longer of body than a walnut, fully covered with down "like as fowi chickens are when hatched. They were "able, I observed, to pick, but the parents seemed not to "feed them, or to bring them any food. For several "days they remained about the same spot, but always "subsequently hidden from view, gradually acquiring "strength, and the power of rapid running, which is "characteristic of the young of this species after it reaches "a few days or weeks old. But, alas, the fate which "befalls the greater part of both animate and inanimate "(sic) life, that of early death, was their lot; and at "about the end of ten days or a fortnight they dis-"appeared, probably devoured by the alligators which "lurk constantly in these waters. Afterwards the parent "birds deserted the lake for another near by and have not "yet, even for an hour returned to it."

To this I may add that it appears as though spurwings invariably make their nests of *Salvinia* which is a very common aquatic weed here. The eggs, generally four in number, are of an olive-brown colour, streaked all over with black as though someone had scratched them over with a pen and indian ink.

I remember on one occasion on these lakes seeing a pair of spurwings followed by a brood of three or four

chicks, and I made an effort to approach them—for the chicks were quite young—with the hope of getting a near view. It was then that I saw some of the most interesting habits of these birds.

As I approached one of the parents took flight, uttering the usual startled cry. The other parent—I presume it was the mother—however, remained persuading the youngsters to hide themselves. She fussed around in a most uneasy manner, guiding them from leaf to leaf, but there was little cover to be found. Still she continued, and, to my surprise, in a few minutes the chicks dived into the water in an open space between the huge lily leaves and disappeared. When she had accomplished this, she, too, made off, but only for a short distance, to a place from where she could see all that was going on. I noted the spot where the chicks had disappeared and paddled up to it with a hope of finding them. But all in vain—they had completely vanished.

However, in the mother's opinion, I had got too near the spot and she decided to detract me. Suddenly she staggered and broke into a peculiar gait, as if something had befallen her. Crouching low, with her wings half expanded, and proceeding with a peculiar limp, she moved from leaf to leaf so that for a few minutes I was completely fooled and thought that an alligator had snapped one of her legs. For quite five minutes she kept up this trick, as long as I was in the vicinity of the spot where the chicks had hidden themselves. Gradually I moved off, and the parents returned. From leaf to leaf they went with outstretched necks seeking their babies—for several minutes they thus searched. Time was pressing so I left them, but just as I was going they flew to a spot, some eight or ten yards from where the chicks had dived, and it appeared as though they had found them.

At this time Blue Gallinules—Blue hens as they are called locally—were also nesting, and I found one of their nests in a clump of Pandanus. The nest was made of dried blades of the same plant, and situated but a few

inches off the water. Eventually six eggs were laid, of a pale yellowish colour spotted with blue and dark brown.

Kingfishers also frequent the lakes, and the large Collard Kingfisher or 'Fisherman,' quite fifteen inches long, with its slate-blue colour above and rusty-brown below, is a constant visitor to the lakes, its harsh unmistakable chatter being one of the familiar sounds, while his small, and perhaps more handsome cousin, the Pigmy Kingfisher or 'Bottom-bridge,' is also occasionally seen.

The little black and white 'Cotton Bird,' too, is common about the lakes and trenches of the gardens, and may also be seen frequenting the trenches of the coast-lands.

Of the game birds of the colony, several are, at least, visitors to the gardens. The Teal Duck mentioned by Mr. Jenman unfortunately is no longer to be seen here, and it is, alas, now only too rare in other parts of the colony. The common sandpiper or 'Nit' may occasionally be seen about the lakes, and the 'Longleg' is also to be met with. Wicissi and Muscovy Ducks have visited the experimental rice fields and frequent the adjacent rice lands at Bel Air, while a small flock of 'Curri-Curri,' most conspicuous birds with their scarlet plumage, have been observed to alight in the gardens.

As the day comes to an end, Gauldings may be seen returning to the islands for the night after a busy day on their feeding grounds on the West Coast; Swallows collect; the Kiskadees keep up an incessant chatter, and the Peacock in the Nursery gives forth its unearthly yell. Night falls, and the big old owl comes forth from the thick clump of oil palms where he has sleepily spent the day, while Quacks pass over and—quack! It is well into the night, and the birds have almost been forgotten when the air is rent by a shrill screech as an owl passes over,

from a nearby tree comes the eerie call of a little goat-sucker—Ookurupow—ow—ow—, recalling the creole legend of the advent of a young stranger, and, as if expressing our very thoughts, comes an enquiring "Who-you?"

In the Report of the Botanic Gardens and their work for the year 1892-93 there appears the following paragraph by Mr. Jenman concerning the birds of the gardens.

"A list of the birds permanently inhabiting, fre-"quently or casually visiting the gardens, giving the "scientific and common names, with brief descriptions of "their characteristic features, habits, etc., classified in "sequence of natural affinity on the lines of the British "Museum catalogue, was drawn up by the late Principal "of Queen's College, member of the Board of Directors, "during the year, and given to me at my request to place "for reference on permanent record in the reports of the "gardens. The work occupied Mr. Percival's leisure "hours for several months, but it was a labour of love."

In 1893 this list was published as "Birds of the Botanic Gardens" in the Demerara Argosy, and subsequently reprinted in pamphlet form. The names of these birds, revised according to modern views of classification, are reproduced below, with the addition of nine species not recorded by Mr. Percival but recently observed. The species recently observed in the gardens are marked * while those not previously recorded are marked with a double **

GALLIFORMES.

Family Cracidae.

Ortalis motmot. "Hannaqua."

COLUMBIFORMES.

Family Columbidae.

Columba rufina. Common wild pigeon of the colony.

**Columbina griseola.* Ground Dove. Common.
—*C. passerina.*
**Columbina talpacoti.* "Barbary Dove." Ground Dove
**Leptoptila rufaxilla,* Ground Pigeon.

RALLIFORMES.

Family Rallidae.

Gallinula galeata. Black waterhen.
Aramides cajanea. 'Killicow.'
Porzana cajennensis. Small red rail.
**Ionornis martinica.* Blue hen.

CHARADRIIFORMES.

Family Charadriiformaes.

Hoploxypterus cayanus. Small spurwing plover.
Hoplopterus cayana.
Pluvialis dominicus. American golden plover.
Charadrius virginicus.
**Actitis macularia!* 'Nit.'
***Totanus melanoleucus.* 'Longleg.'

Family Jacanidae.

**Jacana spinosa.* 'Spurwing.' = *Parra jacana.*

Family Plataleidae.

Harpiprion cayennis. 'Bush curri-curri.'
**Eudocimus rubra.* 'Curri-curri.'
Ajaia ajaja. Spoonbill.

ARDEIFORMES.

Family Ardeidae.

Ardea cocoi. Large blue heron, 'blue crane.'
**Casmerodius egretta.* Large white egret, 'white crane.'
**Leucophoyx thula.* 'White gaulding'=*A. candidissima.*
**Florida coerulea.* 'Blue gaulding.'
***Hydranassa tricolor.* 'Tricoloured Heron.'
**Nycticorax naevius.* 'Quack.'
**Butorides striata.* 'Chow.'

ANSERIFORMES.

Family Anatidae.

** *Cairina moschata.* 'Muscovy Duck.'
** *Dendrocygna discolor.* 'Wicissi Duck.'

CATHARTIFORMES.

Family Cathartidae.

* *Coragyps foetus* 'Carrion Crow' = *C. atrata.*
* *Cathartes ruficollis.* 'Governor Carrion Crow' = *C. aura, C. urubitinga, C. pernigra.*

ACCIPITIFORMES.

Family Falconidae.

* *Milvago chima-chima.*
Micrastur gilvicollis.
Artarina nitida.
* *Rupornis magnirostris.*
* *Busarellus nigricollis.*
* *Urubitinga urubitinga.=zonura.*
Herpetoeres cachinans.
* *Rostrhamus sociabilis.*
Ictinia plumbea.
Falco fusco-coerulescens.=Hypotriorchis femoralis.

STRIGIFORMES.

Family Strigidae.

Bubo scotinus.=virginianus. ?
Octus crucignus.=Scops brasiliensis. ?
* *Tyto perlata.=Strix flammea.*

Family Psittacidae.

Ara manilata.=macavana. 'Eta parrot.'
** *Ara hahni.* Hahn's macaw.
* *Aratinga aeruginosa.=Conurus perginax.* 'Brown-throated Parrakeet.'
Amazona amazonica.
Pinorus menstruus. ?

CORACIFORMES.

Family Alcedinidae.

* *Megaceryle torquata.* Large collared Kingfisher, 'Fisherman.'
* *Chloroceryle aenae.=superciliosa.* Pigmy Kingfisher, 'Bottom bridge.'

Family Caprimulgidae.

* *Nyctodromus albicollis.* 'Who you.'
** *Gen. et sp. incert.* 'Ookurupow.'

SUBORDER. TROCHILI.

Family Trochilidae.

* *Argytina fimbriata.=A. tobaci.* 'Doctor bird.'
Argyrtia leucogastes.
Chlorestes notatus.
Chlorostilbon atala.
Anthracothorax violicauda.
A. viridigula.=Lampornis gramineus.
Heliothrix arita.
? *Chrysobronchus irrescens* ??

COCCYGES.

Family Cuculidae.

Coccygus minor.
* *C. americanus.* Yellow billed cuckoo. "Foolish bird."
Piaya rutilla.
* *Tapera naevia.* 'Wife sick.' 'six weeks.'
* *Crotophaga ani.* 'Old Witch.'
* *C. major.* 'Old Witch' 'King Witch.'

Family Picidae.

Veniliornis sanguineus.
* *Coephleus lineatus.* Great red-crested woodpecker 'Carpenter bird.'
* *Picumnus spilogaster.*

PASSERIFORMES

Family Formicaridae.

* *Thamnophilus doliatus.* 'Check Bird.'

Family Dendrocolaptidae.

* *Synallaxis cinnamonea.* 'Rootie.'

Family Tyrannidae.

* *Fluvicola pica.* 'Cotton Bird.'
Arundinicola leucocophala.
* *Todirostrum cinereum.* 'Pipitoori,' 'Ground Dodger.
* *T. maculatum,*
* *Elainea pagana.* 'Muff bird.'
E. albiceps.
E. sp.
Myiozetetes cayennensis. ?
* *Pitangus sulphuratus.* 'Kiskadee.'
* *P. lictor.* 'Kiskadee.' Small kiskadee.
Megarhynchus pitangua.
* *Tyranus melancholicus.*
T. tyrannus. = *pipiri.* ?
* *Muscivora tyrannus.* Swallow-tailed kiskadee. 'Scissors tail.'

SUB-ORDER ACROMYODI.

Family Hirundinidae.

Tachycineata albiventris.
Progne purpurea.
* *P. chalybdea.* 'Swallow.'
P. tapera.

Family Troglodytidae.

Thryothorus coraya.
* *Troglodytes musculus.* = *furvous.* Common Wren, 'God-bird.'
T. sp. incert

Family Turdidae.

* *Merula phaeopygia.* Common Thrush.
M. fumigata.
M. albiventer.

Family Mniotilidae.

* *Dendroeca aestiva.* "Peas-tree Canary."

Family Fringillidae.

* *Oryzoborus torridus.* "Twa-twa slave."
* *O. crassirostris.* "Twa-twa."
* *Sporophila castaneiventris.* 'Blue back.'
* *S. minuta.*
* *S. lineata.* = *lineola.*
** *Volatinia jacarini.* "Beezing."
Sycalis flaveola.
S. minor.

Family Coerebidae.

* *Coereba chrophyga.* = ? *cyanea.*
Dacnis cayana.

Family Tanagridae.

** *Colospiza cayana.* "Buck-town Sacki."
** *C. flaviventris.* Yellow vented tanager.
* *Tanagra episcopus.* "Blue Sacki."
* *T. palmarum.* "Palm Sacki."
* *Rhamphocoelus jacapa.* "Cashew Sacki."
Tachyphorus rufus = *melaleucus.*

* *Saltotor magnus.* "Tom Pitcher."

Family Icteridae.

* *Ostinops decumanus.* "Bunyah."
Molcthrus atronitens. "Lazy bird."
* *Agelaeus icterocephalus.* "Rice Bird."
* *Leistes guianensis.* "Robin."
* *Icterus xanthornis.* "Yellow plantain bird."
Holoquiscalus lugubris. "Black bird" Boat tail.

In the foreword of the above mentioned list Mr. Percival remarks "The total number of Garden birds cannot be less than one hundred and twenty: of these, with a little practice in distinguishing the species, at least a score of familar kinds may be recognised any day in the course of

NOTE.—It is doubtful whether certain birds mentioned by Mr. Percival in his list ever occurred in the Gardens—their range being in the more remote parts of the Colony. These birds have been marked with a ? in the above list.

half-hour's stroll; and a longer ramble in the less frequented parts will soon bring the number seen and heard to thirty-five or forty kinds."

Unfortunately this number of species no longer frequent the Gardens, and within the past few months only sixty-eight different kinds have been observed. Yet, as previously mentioned, of this number there are nine species which are not recorded in Mr. Percival's list. Still, as Mr. Percival remarks, "Regarded as a whole the birds of the Gardens form a very interesting series, containing good and typical representatives of almost all the orders of the class *Aves*. With the exception of the thrushes and wrens, and a few other more feeble warblers, their vocal efforts must be described as eccentric and striking rather than melodious, but many will attract attention either from their conspicuous colouring or from their peculiar form and habits. For the most casual observer a knowledge of their appearance and names will add much to the pleasure and interest of a ramble in the Gardens, and it may be hoped that in time all visitors will recognise their obligation to these feathered friends, and will help to make the Gardens, as they should be, a sanctuary for all rare and interesting forms of bird-life."

THE PROBLEM OF OUR VILLAGERS.

By E. P. Minett, M.D., D.P.H., D.T.M. & H.

The question of putting our villages into decent sanitary order is a very difficult and thorny one. The necessity for doing so is apparent to all, even the most optimistic apologist for the villagers would be convinced if a visit of inspection were paid.

To inspect a village it is no use to drive into the village in a motor or walk along a few main streets. That is hopeless. The only way is to systematically walk along

The conditions are such that no wonder our death rate is so high and that such a large proportion of the deaths can be attributed to intestinal diseases, usually called 'bad bowels,' and to Malarial Fever. This, with the high infantile mortality rate, will easily account for our present most depressing decline in population and consequent shortage of labour, especially productive labour. By productive labour I mean the man who produces more than he requires for his own personal consumption and has a large surplus of foodstuffs to sell, he is what I would describe as a good colonist, because the money he gets for his surplus products enables him to live in a better house, to be better fed and better clothed. Besides he has money by him to take in more land or to pay for necessities in his house. This man can afford to fence in his land and prevent his cattle straying, he can keep his pigs, if he has any, in one place, and not allow them to wander freely all over the village to gain their food at other people's expense. The law provides for the shooting of these stray pigs, but it is practically impossible to get village Chairmen and Councillors to carry out the law. Many of them,I am told, own pigs themselves. These stray pigs are the curse of the Public Health Department as no sooner is a lot holder compelled to put up a decent sanitary latrine, than it is promptly destroyed by the pigs, who feed on the contents A more filthy and disgusting state of affairs it is impossible to imagine.

Public opinion in villages is dead against putting an end to the pig nuisance; it would seem as if these people would rather live in insanitary surroundings, dangerous both to themselves and their neighbours, than be put to the expense of finding food for the pigs they own.

A strong and vigorous policy is necessary on the part of the police to put a stop to the pig nuisance. It is no hardship to make a man who owns pigs construct a pen and to feed them himself. Or anyway to keep them in the pastures and not in the village, if he prefers to allow them to run wild.

Police action is the only possibility I can see of carrying out the law in this respect. To leave it to the village chairman and councillors is hopeless they either are unwilling or unable to handle the task.

Another of our serious problems in villages is the question of drainage ; owing to the high price demanded by labourers, there is never enough money in the village coffers to pay for keeping the main drains and kokers in order. The consequence is many villages are in a chronic state of being flooded out. There can be only two remedies for this. Either to increase the rates until they can afford to keep the koker drawing properly, or to do as is done in some other parts of the world, that is; conscript all the able-bodied people in the village and make them work for their own good or pay for a substitute.

The work wont do itself nor will sitting down and grumbling help any.

So long as wages are high and the standard of living low, enabling a man to exist on two or three days work, we shall always have the drainage and other work left undone.

This question of labour is rapidly reaching an acute stage and is a very difficult one to solve. Vagrant Acts hardly meet the case because most villagers are not by any means paupers. As many a man has said to me "If I can live by working three days a week, why should I do more ?" After all when we get down to rock bottom, if he is satisfied with the standard of living obtained by such an amount of labour, why should he ?

Education to my mind does not help us at all, because the moment our people reach a certain standard of education they will not do manual labour at all, but enter the already overcrowded market for workers such as clerks, storekeepers, bookkeepers, etc.

A depressing factor is our high Infant Mortality. Other writers have ascribed this to the fact that our illegitimate birth rate is so high. I am inclined to agree

with this as a comparison with other parts of the world show that these two are intimately connected. Unwelcome children are not likely to be well cared for in the first two years of their life when they require careful feeding and nursing. Especially if the fathers contribute nothing to their support.

Much of the ill-health in this colony has been ascribed to malaria and lately the rice fields have been blamed. I do not agree with this statement because rice fields are not nearly such great breeders of mosquitoes as the numerous 'pot holes', and excavations dug to obtain earth to burn. I would from a health point of view much rather see rice fields than 'pot holes' and swamps. A rice field does not breed nearly so many mosquitoes. Instead of being a useless and dangerous piece of land a rice field is productive of both food and money.

I admit rice growing is not the healthiest occupation but still it has many advantages over no cultivation at all and the so-called pastures.

One last word about malaria and its effects on workers. No doubt it does reduce their capacity to work, especially during and after severe attacks of fever. But I dispute that it is at all concerned with the 'inclination' and will to work. To quote one example alone the inhabitants of northern Italy and Syria including the Jordan Valley suffer far more from malaria in its more severe forms than do our people. Yet they are a very hard working, thrifty people. It is surprising the amount of money these people make out of their sheep and goats, and the cultivation of every available piece of soil in a rocky and barren country.

Grain, olive oil, figs, dates, grapes, oranges and wine are produced and exported from Haifa and Alexandretta in large quantities, and yet in travelling through this stony barren country you wonder how on earth it is done. The answer is hard work and thrift on the part of the numerous peasant farmers. I am told by experts that the soil surrounding our villages is far more

fertile than most parts of Egypt and the East yet we don't export or even produce anything like the same amount of produce per acre. Something wrong somewhere. What is it?

Several people in our villages along the East Coast have told me that they go to Georgetown to buy plantains, cassava, yams, etc. I expressed surprise that they should go all that distance and pay money to buy what they could grow on their own land at less cost. They admitted that they had plenty of time to attend to their own cultivation and land to do it in. And yet they simply did not do it.

This may sound absurd but it is true as anyone can find out if they make enquiries. The reason is difficult to understand, it is not drink, because the average villager, especially the negro villager, is not a drunkard by any means. Perhaps it is pride, may be these people are "too proud to work" just as President Wilson I believe once said his people were "too proud to fight." It is not my place to judge them.

RICE CULTIVATION IN BRITISH GUIANA.

In Vol. 3. No. 4 of the Journal of the Board of Agriculture which appeared in April, 1910, the Director of Science and Agriculture and the Government Botanist, Mr Stockdale, published a comprehensive article on Rice cultivation. This paper is now reproduced; it has been brought up to date with numerous corrections and additions.—Editor.

HISTORY.

Rice was first introduced in about 1750. It was cultivated to some extent as food for the slaves, and by the end of the century even runaways or 'bush negroes' commonly grew it in the neighbourhood of their hiding places. Punitive expeditions always destroyed these cultivations. It was reported in 1810 that there was such a large area under cultivation at the back of Mahaicony

that a special expedition to destroy it was undertaken. In 1813 when supplies from the United States were stopped it was suggested that British Guiana should grow larger quantities of rice, but nothing seems to have been done.

The Hon. W. Russell records that in 1848, rice was being cultivated in Berbice by 'Timini' Africans. In 1853, some padi was introduced from Georgia, and grew very satisfactorily. In the same year a company was formed in Georgetown for the cultivation of 150 acres of rice at Plantation Vive-la-Force on the Demerara River, but this venture did not prove successful. Several other attempts were made at the cultivation of rice in different parts of the colony, but some failed from want of knowledge and others from lack of water.

In 1865, encouragement was given to some coolies from the hill districts of India to cultivate rice on the West Coast, Demerara, and about 16 acres were grown with very satisfactory results. The industry expanded for some years but subsequently the area under rice became reduced until in 1872 only a small area was cultivated in the Abary district by East Indian proprietors. Later, however, encouragement was given to rice cultivation in Essequibo, and in 1886 over 2 0 acres were under this crop on the western Essequibo coast. Small areas were also cultivated in the Mahaicony, Abary, and Canje Creek districts. From 1886 the industry gradually extended and in 1893 the area under rice was returned as 6,500 acres but in 1901 a shortage of the Indian crop resulted in greatly enhanced local prices and the acreage increased to 19,000 acres. Seven years later the area under rice was nearly 38,000 acres, whilst in 1917 it was 65,000.

In 1918, owing to a bad season it was 60,000 acres. A greater acreage is anticipated for 1919.

PREPARATION OF THE BEDS.

Land to be put into rice should be laid out in beds with dams 2 to 3 feet wide and 2 feet high between them.

made for their drainage and irrigation. The most satisfactory arrangement we have found in our experience is one, whereby the irrigation trench runs across the 'tops' of the beds immediately outside the head dam, through which small wooden 'kokers' are placed in order that water can be admitted to any bed independently of the others. The beds are made to slope sufficiently with a shallow drain down the middle of each so that the drainage is accomplished at the ends of the beds away from the irrigation trench. This system of irrigation and drainage has worked most satisfactorily on the rice fields at the Botanic Gardens, and these fields should be visited by all who contemplate improvements in their rice cultivation in this direction.

In throwing up the dams between the beds, care must be taken to remove as little as possible of the surface soil from the beds, or otherwise if soil is taken off too deeply, a heavy, frequently alkaline subsoil is reached, which will only give small yields. Poor yields are often the result of taking off too deep a layer of soil for making up unnecessary high dams. The security of the dams must be carefully attended to, for proper attention to the dams is one of the most important duties of the rice cultivator.

CULTIVATION.

The best land for rice is a clay-loam with an almost impervious subsoil. It should be carefully forked or ploughed four to five weeks before the crop is to be planted. The forking or ploughing should not be deeper than about 6 inches or otherwise the subsoil may be turned to the surface, and the yields reduced. The depth to which land may be forked or ploughed varies with the locality, and experience soon indicates the correct depth to adopt. The first part of the land to be cultivated should, however, be the nursery. This should be carefully chosen and should be on the very best land, where a good supply of water can be obtained. Sufficient care is not usually taken in the choice of suitable nurseries. On this choice, particularly if the weather conditions are unfavourable, often depends the success or failure of the crop, and there-

fore the selection of good land cannot be too strongly emphasized. The nursery should be flooded as soon as possible after forking and levelled ready for planting seed. During the four weeks that the seedlings are growing in the nursery the cultivator must turn his attention to the land for the general planting. It has to be forked or ploughed, levelled and prepared for the young plants that are to be transplanted. The breaking down of the soil after the forking is usually done by hoes or by means of primitive harrows and levelling is accomplished by dragging a log of wood backwards and forwards, or by inverting the harrow and drawing that across the beds. The land should resemble 'drift mud' before it can be considered to be in first class condition for transplanting, but this thorough breaking up of the soil should not be more than 4 inches in depth.

In some parts of the colony, especially in the Mahaicony district mechanical tillage, performed by several kinds of motor tractors has proved successful. These soils are of a pegassy nature and lend themselves to this kind of cultivation. On the heavy clay soils about the coastlands, if damp conditions prevail, many of these tractors have proved a failure owing to their inability to obtain a grip on the exceedingly slippery surface of the soil. It is possible that these conditions could be overcome by the employment of the right kind of 'tread' on the tractors.

SELECTION OF VARIETIES.

Varieties of rice are exceedingly numerous and many have been tried at the experimental fields, Botanic Gardens, Georgetown. The principal varieties at present under cultivation are given in Table I following. They contain ordinary or Lowland Rice No. 75 and its variants, Hill Rice No. 6 and its variant No. 1, the Creole variety and the Blue Rose variety. With the exception of the last named all these varieties have been under cultivation in this field since 1903. Their yield for the past three years are also given.

In Table 2 are given several other variants of the 75 type—Nos. 1, 2 and 4 also Demerara Creole variant 2,

Creole specially selected and Blue Rose variety. These are cultivated in smaller plots 18 square rods each in the North Field. With the exception of the Blue Rose variety they have all given fairly high yields this year and are of considerable promise.

Table 3 contains a collection of several imported varieties. Some from India, the Federated Malay States, Surinam and the United States of America. It also contains three of our own hybrids as well as O.75 used as a control plot. These have been under experimental trial for several years. The varieties given in these three foregoing tables comprise all the varieties now under general and experimental cultivation. Those in No. 1, are standard varieties. In No. 2 these are of considerable promise, while the varieties in No. 3 are not as promising as those contained in table 1 and 2, several of these apparently are not adaptable to local conditions, soil etc. but are still under experimental test.

TABLE I.

Variety.	1917	1918.	1919.	Average Mean for 3 years.	
O. 75 ..	32.50	30.65	27.85	30.33	North Field *Large Plots.*
O. 75. v. 6 ..	30.59	30.61	28.96	30.05	
O. 75. v. 7	32.62	32.06	27.89	30.85	Weight of bags given
H. 6 ...	30.74	29.31	26.20	28.75	=140 lbs.
H. 6. v. 1	30.57	30.17	25.85	28.86	
Dem. Creole	32.55	31.02	27.43	30.33	
Blue Rose	-		15.51	15.51	Only planted in 1919.

TABLE II.

O. 75. v. 1	30.06	30.60	36.52	32.39	North Field—*Medium Plots,*
O 75. v. 2 ..	33.27	25.11	39.94	32.77	
O. 75. v. 4	34.96	33.81	40.00	36.26	*Weight of bags given*
Creole v. 2 ..	37.14	30.29	33.03	33.49	=140 lbs.
Creole specially selected.	32.08	25.54	33.21	30.28	
Blue Rose	-	15.71	21.43	18.57	Only planted in 1918 &1919.

TABLE III.

VARIETY.	1917.	1918	1919	AVERAGE MEAN FOR 3 YEARS		
O. 75	29·89	19·46	23·06	24·13	North West Field.	Small Plots.
C. G. Gram	[illegible]	[illegible]	[illegible]	[illegible]		
Hybrid 33	24·29	22·32		[illegible]	Average for 2 years	Weight of bags given=140 lbs.
,, 35	26·07	17·32	30·00	24·46		
,, 37	28·57	25·54		[illegible]	Average for 2 years	
Surinam Creole	25·73	24·46	28·24	26·14		
Ketan Itan ...	2[illegible]·64	13·57		[illegible]	Average for 2 years.	
Bodoe Peti	27·8[illegible]	34·86		[illegible]	,, ,, ,, ,,	
Sapanet	37·71	25·00		31·35	,, ,, ,, ,,	
Kinja Rauti	18·57	16·07		17·32	,, ,, ,, ,,	
Nja Kyank	21·79	13·93		[illegible]7·86	,, ,, ,, ,,	
Baw Yut	23·21	11·79		17·50	,, ,, ,, ,,	
Kunchor	16·07	7·14		[illegible]1·60	,, ,, ,, ,,	
Berbice Creole	18·21	17·86		18·03	,, ,, ,, ,,	
Radin	19·71	14·64		[illegible]	,, ,, ,, ,,	
Sanlap	9·29	8·93		9·11	,, ,, ,, ,,	

TABLE IV.

The following shows the varieties of rice grown with Lamaha and Artesian Well Water.

The North Field Rice was grown with Lamaha Water.

The D'Urban Field Rice was grown with Artesian Well Water.

Field.	Variety.	1914.	1915.	1916.	1917.	1918.	1919.	Mean for 6 years.
North	O 75	27.09	36.36	35.13	32.50	30.65	27.85	33.26
D'Urban	,,	22.97	22.43	21.03	26.10	21.71	21.26	22 58
North ✓	H.6.	34.30	33.72	32.95	- -	—	—	33.66
D'Urban ✓	,,	24.61	25 65	19 00	- -	—	—	23.09
North ×	Dem. Creole	—	—	33 7[illegible]	32.55	31.02	27.43	31.18
D'Urban ×	,,	—	-	20.53	30 23	22.25	22.25	23.84

Those marked ✓ average for 3 years

SELECTION OF SEED.

The local market demands a long-grained type of rice, and cultivators should be careful to select only such varieties as meet with ready favour with the millers.

The paddy distributed by the Board of Agriculture is practiaclly pure to type but unless great care is taken in the selection of seed a rapid deterioration in quality may take place. A large number of growers go to the mills for their seed paddy. They pay but little attention to the quality of the seed selected and naturally the results are not as satisfactory as they should be. Others keep back paddy for planting purposes and here again little or no thought is taken as to selecting only the very best. The grower should always use the best possible seed for planting purposes. It should be a clean uniform sample and the individual grains should be well filled; careful selection of seed paddy is a matter of the utmost importance. Not, however, is it of importance to the grower alone, but also to the miller and consumer. Mills can work a uniform sample of rice much cheaper than a mixed one, the product is more saleable, and as competition becomes keener the millers will naturally look to the most careful cultivator. Growers should commence to select their seed and the millers should see that their selection is along the right lines. The seed which is supplied by the Board of Agriculture is distributed expressly for seed purposes. That which was distributed this year is intended to be increased sufficiently to be spread over a wider area next year. All growers that receive seed from the Board should reserve what they obtain from it for seed next year, and if they obtain more than they require they should offer it to the mills expressly for seed purposes. Seed selection is a paramount importance for the successful furtherance of the industry, and the sooner the present suicidal policy of using almost any sample of paddy, no matter how inferior, for seed purposes is completely suppressed the sooner will the general returns be increased and the quality of the paddy improved. One of the most promising signs of progress in the rice industry, will be

when growers obtain their seed paddy from others who make a speciality of growing rice of the best quality purely for sale for seed purposes. Carefully chosen seed will give larger crops without increased expense. A good grain is one which is white, smooth, not sticky, free from dents and creases. It should be twice as long, as broad, and as thick as possible. It should be clear, almost transparent, not cloudy. The best method to select seed for planting is to go into the field just before reaping and look for healthy plants. Collect heads which are as much like each other as possible and choose heads from early maturing plants; do not pick unripe plants. It is best to collect more heads than will be considered enough for next year sowing. Heads containing red grains should at once be rejected.

SOWING OF SEED IN THE NURSERY.

In some districts rice is sown broadcast but usually the seed is sown in nurseries, and the general crop is transferred therefrom. Seed selected for sowing should preferably be placed in a bag and soaked in a trench for 48 hours. The bag should then be taken out and placed on dry land in the shade and covered down. The heat of the germination of the seeds causes them to burst, and even to sprout slightly. This soaking is advantageous because it makes it possible to see what proportion of seed germinates and thereby assists the grower in sowing a sufficient, but not wasteful, quantity of seed for his crop. It is also generally accepted that ducks prefer hard paddy and do not very often trouble that which has been soaked.

The seed beds in the nursery must be carefully prepared. They must be perfectly level. The levelling can best be accomplished by dragging a weighted board over the surface. They must be moist and no water should be on the surface or otherwise the seeds will rot. Sprouted seeds should then be thinly broadcasted and the surface of the beds kept moist by allowing a small quantity of water to gently flow over them or by watering with cans. On no account must water be allowed to remain over the surface or the seeds will rot. When the seeds commence to grow and take root the water is allowed to remain and the larger

the seedlings grow the deeper may be the water remaining on the surface.

TIME OF SOWING.

Sowing of seed in the nursery should commence at the end of March or early in April if the best results are to be expected. There can be no doubt whatever that the best crops are only to be expected when attention is given to the time of sowing the seeds. Growers seem to have recently attempted to sow rice all the year round, with the result that many of their crops have not paid for the labour expended upon them. *Low returns are largely the result of planting at the wrong time of the year.* If seeds were planted in the nurseries in March or April and the seedlings transplanted in April or May, higher general returns would be obtained and the condition of the rice industry greatly improved. It would be interesting to ascertain how much rice was practically thrown away last season by not adhering to correct period for planting. A very large quantity was lost by drought shortly after the seedling were transplanted into the fields and a greater quantity was lost by the rice coming to maturity in the wet season. Where irrigation is not under absolute control, there is always a danger of loss of a crop by drought if planted out of season and the grower should always bear in mind that rice cannot properly ripen or be satisfactorily gathered in wet weather. Planting should be carried out so that ripening takes place in the dry season.

QUANTITY OF SEED NECESSARY.

The quantity of seed necessary to plant an acre is calculated to be from 8 to 10 gallons according to variety and to germination, and it should always be remembered that the sowings in the nursery should be 'successive,' *i.e.* sown in just sufficient quantities as there is labour available for transplanting. For example:—A man intends to cultivate 8 acres of rice, and will require say 80 gallons of paddy. This should not be all sown at one time, but should be sown in four lots of 20 gallons each, the first lot the last week in March or the first week in April, the second the following week and so on, so that the

first two acres are planted up during the end of April or during the first week in May, the second in following week, etc.

The reason for this is obvious. It is the most economical method of distributing the work. Seedling rice is ready for transplanting from the nursery in 4 weeks from the time of sowing and should be transplanted before it is 6 weeks old. After 6 weeks the plants commence to joint at the base and if then used for transplanting they remain stunted, do not tiller, and consequently give unsatisfactory returns. Sowing large quantities of seed at any one time, than can easily be handled is therefore an utter waste of time, trouble and money.

TRANSPLANTING.

When the seedlings in the nursery beds are about 4 weeks old they are ready for transplanting for the general crop. The plants are usually about 12 inches high at this time but no joints should be showing at their bases. The lifting of the plants from the nursery should be carefully carried out. It is not sufficient to simply pull the plants up—only bad results can be obtained if this is the practice. Before lifting, the soil around the roots should be loosened. This may be done by sticking the fingers of both hands round a quantity of plants so that a good 'double-handful' of plants can be taken up with all the mud adhering to the roots. After this is done the greater portion of the mud should be washed off from the roots and the plants put on one side and gathered into bundles of about 1,000 washed plants each. These are now ready to be carried to the fields for the planters, and to save time, they should be distributed at suitable distances over the beds so that the planters can readily obtain them. The planter unties a bundle, takes out a handful of plants, washes off practically all the soil attached to the roots, screws off the top three or four inches of the top portion of the seedlings and proceeds to dibble them in. The long straggling roots that are often noticed on rice plants ready for use by the planter are in practice always left untouched, but it is

thought that it might be beneficial if they were also broken off in the same way as the top portions of the plants are removed.

The seedlings should be planted 2 to 3 plants (not more) in a hole at distances of from 9 to 12 inches apart. They should simply be pushed in the soft mud to the depth of one to two inches. The planting of 3 plants in a hole is considered to be the safer, and the distance between the plants depends upon the variety. For the Creole variety and Nos. 75, 3 and 6, any distances not less than 9 inches or more than 12 inches will give satisfactory results, but it has been found that the finer grained varieties experimented with, give better returns if planted about 6 inches apart. A selection of plants as they are taken from the nursery and as they are being planted should be carried out as far as is practicable. Only the strongest plants should be used.

Experiments have been carried out at the Botanic Gardens in planting single plants to the hole. The results have shown that satisfactory returns can be obtained by this method and that a considerable less quantity of seed per acre is required, but the extra expense incurred in separating the seedlings and in planting them separately is not usually commensurate with the saving made in the seed paddy. It cannot, therefore, be recommended that the seedlings should be planted out singly, especially where irrigation is either impossible or where it is unsatisfactory. Three plants per hole is our general recommendation for this colony.

AFTER-CULTIVATION.

Plants after transplanting usually lie 'flat' for a day or two and then commence to stand upright. In a week, if the land has been well prepared, they will have taken root. In irrigatable areas, as soon as a bed has been transplanted, water should be cautiously run on and its depth regulated, but in any case it must not be more than 2 inches deep until the plants have taken root. The rice is now kept irrigated until the ripening stage is reached, and the depth of the water should be from 2 to 3 inches as a mini-

mum to 5 to 6 inches as a maximum, the depth being regulated according to the growth of the plants. It is estimated that a crop of rice in this colony, to give the maximum returns, requires from 12 to 18 acre-inches of water per year according to the season, in addition to the rain that falls. Planters of non-irrigatable rice lands are wholly dependent upon the season for satisfactory returns and therefore they should be most particular to adhere to the proper sowing and planting season of April and May.

Two weedings should generally be given to a rice crop after it has been transplanted. These are usually given in the early period of growth, for transplanted rice soon commences to tiller and therefore satisfactorily keeps down weeds. A good Padi Plant is one which produces five or more stalks, each bearing a medium sized bead containing well filled, mature grains. All the heads of a plant should be borne at the same height.

MANURING.

In British Guiana applications of manures are not given to rice. Leguminous and other weeds are allowed to cover the beds after the rice is cut, and this material is usually either forked or ploughed in. It is possible that at a later date it will be of advantage to sow leguminous crops in the 'off' parts of the year to be forked or ploughed in as green dressings.

Where rice becomes 'lodged' (or 'laid') it is evident that the land is sufficiently rich in nitrogen to grow large quantities of straw, and that nitrogenous manures are not required. After continuous cultivation for some years, the readily available nitrogen may become exhausted. Experiments at the Botanic Gardens indicate that phosphate may be desirable as manure for rice and that potash will be required after a few years of continous cultivation. Bush water contains a relatively large quantity of nitrogen and potash, and where this is used for irrigation it may not be necessary to consider the application of any artificial manures except possibly that of phosphates. Application of lime are not advisable. A considerable waste of ric

straw is occasioned every year by burning, and it would be worth while considering whether this could not economically be made into manure to be used in the nursery beds, for it is generally recognised that the nursery should be manured wherever possible. The value of dressing sugar cane lands with rice straw has been recently demonstrated by the Department.*

PERIOD OF GROWTH AND REAPING.

The period of growth varies with the variety. It is usually about 4 months, but may extend to as much at 6 months. Several early maturing varieties have beens experimented with, and it has been found that whereas they retain their power of early maturity during the first one or two crops, they later adapt themselves to the conditions of the colony, and take about the same period to reach maturity as the local varieties. Early maturing varieties usually give a smaller total crop, and the returns of paddy per acre are generally less. If it is desired to plant early maturing varieties it will be found necessary to import fresh seed from its country of origin at short intervals.

As the heads begin to change colour and the grain reaches the 'dough' or 'ripening stage' the irrigation water should be entirely run off. Ripening now takes place, and it is essential that the beds should be kept quite dry or otherwise the proper degree of hardness of grain is not obtained. The ripening takes from two to three weeks and when the grain is full and sufficiently mature it is cut by hand. In India, it is the common practice when the standing crop is fully ready for reaping to 'fell' it flat to the ground with large bamboo poles, for it is thought that reaping is thereby greatly facilitated. This practice might be given a trial in this colony, where the rice has not been 'laid' by rain or wind storms.

The cut rice is either beaten out immediately or bound into sheaves and left for a day or so on the beds or upon the dams or 'stooked' (or 'shooked') up in the fields. The

* Journal of the Board of Agriculture of British Guiana, Vol. XII No. I.

different methods appear to differ with the varieties grown and also upon the degree of ripeness when cut. Some varieties have to be threshed out as soon as possible or otherwise a considerable quantity of paddy is lost, while with other varieties the grains adhere strongly, and then it is an advantage to tie up the rice into sheaves and leave them on the dams or to make 'stooks,' as it thereby dries and threshes out better. It would appear that if there is any uncertainty as to whether 'stooking' would be preferable to leaving the sheaves thrown on the dams.

THRESHING AND WINNOWING.

Threshing is done by hand either over a cross-bar of wood or on a sheet spread on the ground, or by tramp-ling by oxen. Winnowing is usually accomplished by hand. Winnowing machines are being used by some growers, and if their efficiency were generally recognised it is probable that their use would become more common Where a single grower might not be justified in purchasing a winnowing machine, a few growers combined together might have sufficient rice to warrant its purchase Steam threshing machines could not under the prevailing conditions of rice culture be used to advantage in this colony as means of transport are not available, nor could such machines work satisfactorily in the fields themselves.

All rice after it has been threshed out and winnowed should be stored in a dry place as far as possible away from the reach of vermin. Rats and other vermin should be destroyed if they become at all numerous.

YIELDS.

The average returns in bags per acre since 1910 are indicated in the following table.

Year.	Yields in bags of 140 lbs. of Paddy per acre.	Inches of Rainfall.
1910—1911	17·7	98·41
1911—1912	20·5	88·15
1912—1913	20·6	74·04
1913—1914	20·3	85·62
1914—1915	19·7	70·36
1915—1916	20·7	79·59
1916—1917	18·8	91·64
1917—1918	19·2	89·82
1918—1919	9·8 *	88·69
Means—1910—1919	18·5	85·14

* This exceedingly low return was due to the almost total failure of the rice crop in Berbice owing to lack of rain at a critical period in the growth of the rice.—Ed.

The table shows that on the whole the average returns are not governed by the annual rainfall. The yield depends far more on the distribution of the rain during the year, and especially during the crop season, than on the total precipitation. It varies with the seasons in different districts and yields of 35 to 40 bags are not uncommon. With attention, the average yield ought to be considerably raised. In some countries the average yields are stated to be from 60 to 80 bushels per acre which is equivalent to 24 to 32 bags of 120 lbs.—yields in excess of the local ones. In India from 15 to 20 bags are reported as being obtained at Experiment Stations, whilst the general yields are only from 9 to 14 bags per acre according to land, climate and mode of cultivation. In Burma the average yield is said to be 14 bags per acre. But rice-growers in British Guiana with average yields 21 bags per acre cannot, owing to the higher value of labour, compete commercially with the yields of 9 to 14 bags obtained with the cheap labour of India and Burma.

ENEMIES.

Birds are among the principal enemies of the rice crop of this colony. Wild ducks, principally the Wicissi (*Dendrocygna discolor*) destroy a large quantity of paddy sown in the nurseries but they prefer hard paddy and

therefore the damage can be reduced to a considerable extent by soaking the seed before sowing. A number of other kinds of birds (principally the Rice Bird *Agelaeus icterocephalus*) feed on the rice during the growing season or as it is ripening. Their ravages can be kept down to great extent by scaring.

Three fungoid diseases have been recorded by C. K. Bancroft as attacking rice in British Guiana, namely, Rice Blast, *Piricularia oryzae,* Rice Smut, *Tilletia horrida* and Rice Stem Rot, *Sclerotium oryzae.* Neither of these perform damage of any magnitude.

Insect pests are not numerous and do not cause any substantial loss. The following is the list to date drawn up by the Government Ecconomic Biologist.

LEPIDOPTERA.

Remigia repanda Fab. Larva destroys the foliage more particularly of the mature plant.

Laphygma frugiperda S.&A. Destroys the foliage, more particularly that of the young plants in the nursery.

Macnas laboulbena The larva, which is aquatic, destroys the foliage.

Diatraea saccharalis L. Larva bores into the stem.

The larva of a species of Hesperid butterfly feeds on the foliage.

HYMENOPTERA.

Solenopsis pylades Forel. This ant hollows out th stems of fully grown plants.

COLEOPTERA.

Two species of Chrysomelid beetles destroy the foliag

HOMOPTERA.

Cercopidae. Tomaspis flavilatera Urich.

Pemtatomidae. *Mormidea ypsilon* L. Destroys th developing ears.

Tibraca limbativentris Stol.

ORTHOPTERA.

Locustidae. *Conocephaloides maxillosus* Fab. Des troys the foliage.

Of these insects the larvae of *Laphygma frugiperda* S. & A. are the most destructive.

SUGGESTIONS FOR IMPROVEMENTS.

A certain area should every year be set aside by every rice grower on a moderate scale for seed paddy for the next crop. The best land should be chosen and only the best paddy sown. It would be of advantage if only seed obtained from the Board of Agriculture were this year sown in these specially selected plots. This rice is practically pure, and would constitute a good sample to commence with. Before sowing in the nursery, it should be picked over by hand in order to remove any bad grains. In every sample of rice there are always some bad grains and these should be removed if it is being used for the special purpose of raising seed for the next year. All black grains should also be picked out, as they tend to spoil a sample of yellow paddy, and they soon increase to such an extent that the paddy can only be classed as 'mixed.' When these specially selected rices come into ear, they should again be gone through and all the heads having undesirable character should be cut out. All red-grained rices, black rices, and barley rices should be removed. If this is done, an excellent sample of paddy will be obtained for the next sowing and a more uniform crop will result, whilst, most probably, increased yields and an improvement in the paddy to be offered for sale will be accomplished. If every grower would attempt to improve the rice to be used for seed-purposes, a great improvement would soon result and rice of a much more uniform character would be obtained. Increased yields and increased prices for any kind of crop can only be obtained by a careful attention to the selection and propagation of material for seed purposes. Rice is in need of just such care, if better results are to be looked for. The Board of Agriculture supplies pure strains of high class paddy. They should be made the starting point for growers to improve their seed paddy and thereby increase their returns and their profits. *Plant at the right time of year.*

RICE STRAW AS A MULCH FOR SUGAR CANE.

A continuation of the experiments recorded in Vol. XI. No. 4 of this Journal.

By Prof. J. B. Harrison, C.M.G., Director of Science and Agriculture, and Robert Ward, Superintendent of Botanic Gardens and Agricultural Stations.

Owing to the increasing scarcity of sulphate of ammonia, it is necessary for planters of sugar cane, the yield of which is pre-eminently due and largely in accordance with the quantities of readily available nitrogen found in the soil and in manures used, to seek for other and local sources of this important constituent of plant-food. Great quantities of rice-straw are produced in the colony, almost all being wasted by rice-farmers. For many years—since 1907—rice-straw had been used in increasing quantities in the Botanic Gardens as a mulching material for fruit trees, economic plants, palms, and other ornamental plants. For this purpose it has proved very successful.

The beneficient effects of the rice-straw are due to three causes—1st, the direct manurial action by the addition of the nitrogen, phosphoric acid, lime and potash to the soil; 2nd, its action in preventing the development of weeds especially those of the order Graminae, and 3rd by the large amount of difficulty decomposable woody fibre it adds to the soil resulting in gradually rendering the surface soil lighter and less tenaceous and hence of better tilth.

Analyses of rice-straw grown at the Experimental Fields gave the following results:—

	Creole.	No. 75.
Moisture	57·1	57·1
(1) Organic Matter ...	38·1	36·9
(2) Mineral Matter ...	4·8	6·0
	100·0	100·0

(1) Containing nitrogen ...	·26	·35
(2) Containing phosphoric anhydride ...	·11	·11
,, lime ...	·14	·12
,, potash ...	·80	·66
,, silica ...	4·29	4·53

An application of 12 tons of rice-straw to an acre adds to the soil the following quantities of the more important constituents of plant-food:—

	Lbs. per acre.	
	Creole.	No. 75.
Nitrogen	70	94
Phosphoric anhydride ...	32	32
Potash	214	231
Lime	38	32

The surface dressings of rice-straw over the cane-fields have had a well-marked effect in keeping down the growth of weeds when the straw has been spread fairly thickly over the beds in which are young canes, or over the lands prior to planting it in canes. The action has been very noticeable in our trials, the beds dressed with rice-straw remaining comparatively free from weeds especially grasses, whilst the adjacent beds not receiving any rice-straw became covered with a thick growth of weeds, spurious grasses, etc.

The third action is becoming more marked now that the land has received three successive dressings of rice-straw and the undecomposed fibruous remains are gradually becoming incorporated with the surface soil.

As previously mentioned in this Journal the northern portion of the field which was used for this experiment was re-planted with the three varieties which have been grown on it for several years past; D 625 occupying the beds previously planted with D 145; D 118 those previously planted with D 625; and D 145 those formerly cropped with D 118.

The plant canes were reaped in January, 1918, and

weather in February, 1918, succeeded by extensive rainfalls in March, and the exceptional dry period which commenced in August and continued through September and October during which latter months only 29/100ths of an inch of rain was recorded at the Botanic Gardens, the canes after being cut made a very unsatisfactory spring, and later, when about 6 months old, received a severe check to their growth. These unfavourable conditions materially kept back the development of the canes. It was intended to reap them in May, 1919, when they would have had about 14 months growth as reckoned from the termination of the February, 1918 dry period. But in May, 1919, the rainfall amounted to 28 inches thus being the record during 72 years for the month of May, and the canes could not be reaped until August, 1919. The average results of the ratoon crops of the varieties are shown in the following :—

Variety.	Canes tons per acre.	Expressed Juice.				
		Per cent Canes.	Specific Gravity.	Lbs. per Gallon. Saccharose.	Lbs. per Gallon. Glucose	Indicated Sugar, Tons per acre.
D 625	19.0	62.25	1.073	1.665	.060	1.84
D 118	17.1	61.10	1.076	1.711	.045	1.72
D 145	15.6	59.15	1.074	1.662	.062	1.42

The next table shows the weight in tons per acre of canes and of saccharose in the expressed juice in the series of plots which were either not manured or which received dressings of 200, 300, 400, and 500 lbs. of sulphate of ammonia and 375 lbs. of nitrate of soda per acre respectively :—

	D 625		D 118		D 145		Means	
	Weight in tons per acre		Weight in tons per acre		Weight in tons per acre		Weight in per acre	
	Canes	Saccharose	Canes	Saccharose	Canes	Saccharose	Canes	Sa cl ro
No manure	9.9	1.05	14.4	1.32	10.6	0.85	11.6	1.
Sulphate of ammonia, 200 lbs.	15.5	1.52	15.7	1.67	15.2	1.43	15 5	1.
" " " 300 "	22.0	2.16	17.9	1.71	16.5	1.54	18.8	1.
" " " 400 "	28.8	2.74	19.7	2.02	20.0	1.55	22.8	2.
" " " 500 "	25.2	2.40	21.7	2.20	21.4	1.96	22.8	2.
Nitrate of Soda, 375 lbs.	17.5	1.63	15.5	1.48	13.0	1.20	15.3	1

The average increase due to the nitrogenous manui ings were :—

Lbs per acre. Sulphate of ammonia	Nitrogen	Canes	Tons per acre. Saccharose in juice.
200	40	3·9	0·47
300	60	7·2	0·73
400	80	11·2	1·03
500	120	11·2	1·12
Nitrate of Sromda			
375	60	3·7	0·37

The relative producing power of nitrate of soda an of sulphate of ammonia when applied in proportior supplying equivalent amounts of nitrogen was similar t the experience of the great majority of previous season 300 lbs of ammonia salt producing 3·5 tons more canes c ·36 ton more saccharose per acre than did its equivaler amount—375 lbs. of nitrate of soda.

The average results of the cross-dressings of rice-straw with the three varieties were as follows :—

Variety.	Treatment.	Yield in tons per acre.	
		Canes.	Saccharose.
D 625 ...	No Rice-straw	16·0	1·54
	Rice-straw, 25,000 lbs. per acre ...	22·0	2·13
D 118 ...	No Rice-straw	15·0	1·55
	Rice-straw, 25,000 lbs. per acre ...	19·2	1 88
D 145 ...	No Rice-straw	14·1	1·25
	Rice-straw, 25,000 lbs. per acre ...	17·2	1·58
D 625) ...			
D 118) ...	No Rice-straw	15·0	1·45
D 145) ...	Rice-straw, 25,000 lbs. per acre ...	19·5	1·86

The dressings of rice-straw produced the following excess yields:

		Tons per acre	
Variety		Canes	Saccharose
D 625		6·0	0·59
D 118		4·2	0·33
D 145		3·1	0.33
	Average	4·4	0·42

The results of the dressings of rice-straw on the variously treated plots were :—

	Weight in tons per acre Canes.							
	D 625.		D 118.		D 145.		Mean.	
	Without Rice straw.	With Rice straw.	Without Rice straw.	With Rice straw.	Without Rice straw.	With Rice straw.	Without Rice straw.	With Rice straw
No nitrogen, no potash ...	8·4	10·0	11·4	13·0	7·3	14·4	9·0	12·5
Potash only	7·5	16·0	12·7	18·1	6·9	14·1	9·0	16·1
Nitrogen only (200 lbs S.A.)	14·4	16·4	13·3	20·9	11·4	13·6	13·0	17·0
„ „ (400 „ „ „)	22·6	29·8	21·6	18·9	21·2	19·6	21·8	22·8
„ „ (500 „ „ „)	26·4	30·2	20·4	22·2	18·6	20·0	21·8	24·1
Potash & Nitrogen (200 lbs S.A.)	13·0	18·0	15·8	19·3	14·3	18·9	14·4	18·7
„ „ „ (300 lbs S.A.)	18 2	25·8	16·8	19·0	15·9	17·1	17·0	20·6
„ „ „ (375 lbs N.S.)	12·1	22·7	12·6	18·3	12·4	13·5	12·4	18·2
„ „ „ (400 lbs N.S.)	29·0	33·8	16·6	21·6	19·3	19·7	21·6	25·0
„ „ „ (500 lbs N.S.)	21·0	23·2	21·2	22·8	20·9	26·9	21·0	24·3

The average increases due to the application of rice-straw are :—

Treatments	Tons of Canes per acre
No Nitrogen	3·5
Sulphate of Potash only	7·1
Nitrogen only as Sulphate of ammonia	2·4
Sulphate of Potash and Nitrogen as Sulphate of ammonia	3·7
Sulphate of Potash and Nitrogen as Nitrate of Soda	5·8

It appears from this comparison that whilst the gain of sugar-cane may have been in part due to the nitrogen supplied by the rice-straw, other factors such as the improvement of the tilth of the soil by the incorporation in it of the residual resistant fibres of the straw, discouragement of the growth of weeds; addition of readily

decomposable vegetable matter; and the addition of potash and possibly phosphates must have contributed to the excellent results obtained.

From the results of the comparative trials it is evident that it is well worth the while of a sugar-planter to make large scale trials with any rice-straw which may be produced on his estate, bearing carefully in mind that the full advantage of this mulching will not become apparent until repeated over several crops.

On several occasions we have pointed out that although our soils are extremely rich in potash there is always a possibility that sugar-cane cultivation long-continued without any break may result in the readily available potash of the soil being the first soil-constituent to show signs of commencing depletion. From certain observations during the preceding series of experiments in this part of the experimental field we considered it desirable to ascertain if this condition may not be arising there. Therefore a series of the plots were arranged to be manured with sulphate of potash at the rate of 160 lbs. per acre in addition to the usual nitrogenous manurings. This was done in 1917 but it was not possible to secure supplies of potash salts in 1918. Hence any gain which accrued in 1919 on the plots receiving potash in 1917 will be due to the residua of the application.

The results are given below:—

NO RICE STRAW.

	No Nitrogen.		Sulphate of Ammonia.			
	No Potash	Potash (1917)	No Potash	200 lbs. Potash (1917)	No Potash	400 lbs. Potash (1917)
1918	24.4	24.2	27.5	29.8	41.8	45.0
1919	9.0	9.0	13.0	14.4	21.8	21.6
Mean	16.7	16.6	20.0	22.1	31.8	33.3

WITH RICE STRAW.

18	25.9	28.7	30.5	34.3	39.3	46.9
19	12.5	16.0	17.0	18.7	22.8	25.0
	19.2	22.4	23.8	26.5	31.1	36.0

The upper half of this table shows that the land ich had received dressings of 200 lbs. and 400 lbs. of phate of ammonia for many years had become some-at deficient in readily available potash with the result it applications of sulphate of potash to the sugar-canes plant canes produced appreciable increases, but that e residual action of the manurings with potash salts in 17 had little if any effect on the ratoon crops of 1919. nere the mulching with rice-straw resulted in more ourable cultural conditions the effects of the applica-n of potash salts were well marked, but in 1918 and in .9 although to a less extent in the latter than in the mer year.

These results indicate that the supply of immediately ilable potash in the soil which has not received manuri-lressings since 1892 has become somewhat depleted, that the nitrogenous dressings cannot exert their full ects unless aided by applications of potash salts.

[EMICAL CONTROL ON OUR SUGAR ESTATES

3y K. D. REID, Assistant Government Analyst, Government Laboratory, British Guiana.

The very interesting paper which appeared in the rnal of the Board of Agriculture for the April-June rter, written by Mr. H. E. Murray, on our sugar in-stry was more than of local interest. Facts were itilated which many had overlooked, and apart from international question of Bounties, which has from e to time found expression in local papers as well as in

the official organ of West Indian interests in England, the difficulties under which the Planters here have had to contend were faithfully portrayed by one who has thorough experience and has had to look at things as they were and not as we would like them to have been.

We were asked a few years ago "not to put our eggs into one basket" and the expression seemed at one time to have gained favour, but with the great war, bringing as it did, many problems which at times seemed to overshadow or blot out altogether pre-war conceptions of things political as well as problems of an economic nature, the question of further extending our cane cultivation so as to enable the British Empire to be self-supporting became the watchword of men who by virtue of their political and financial positions are fitted to undertake the burdens of the state.

As soon as the desirability of the extension gave place to the fact that there was, in the tropical possessions of the Crown, land suitable for cane cultivation on a gigantic scale, which, if utilised, would enable in part the dreams of our statesmen to come true—namely a self-supporting empire—as is but natural, stock was taken of our existing cultivation and agriculturists and those interested in agriculture from the financial point of view were not diffident in coming forward to assist in the work of re-construction.

It is to be regretted, however, that this work within the Empire should have been so hindered in the past by a policy which led to unfair competition from without and that, as was to be expected, while West Indian planters and those in British Guiana were aware that with improved machinery—which many were unable to procure and so were gradually out-distanced by their more favoured American cousins in Cuba and elsewhere—there was also the question of more up to date methods in actual cultivation and also there were problems awaiting solution not only in the factory but in the field.

I fear there is much which we will have to admit was nd is beyond our immediate control but I am strongly of he opinion that there is also much we could have conrolled had we the material to work with.

While the war has done a great deal to bring forcibly efore the public the value of Science in all great ndustrial undertakings, it cannot be said that this fact vas altogether unknown. The central Empires made full ise of the scientific brains of the country for many years revious to the war and Americans have in the past kept breast of the gigantic strides which Science has made within the last century. As applied to Agriculture, and more especially to the cultivation of the sugar-cane, the Government of the United States of America and those financially interested have demonstrated practically the value of applied Science and in this they have been assisted by a staff of scientifically trained men.

I do not wish to imply that British Scientists have been backward, on the contrary, in the face of Governmental apathy they have held their own and in many instances led the way.

The success of the sugar manufacturers in Cuba and in the other sub-tropical possessions of the United States of America is principally due to the many problems in the manufacture of the commodity and which as problems are not confined to sugar but to all things exposed for sale in the commercial markets of the world, having been solved or being solved by men, who by virtue of their scientific training, were in a position to approach the many obstacles to progress, and if not remove, at least control them to a very great extent.

Recently the Officer administering the Government of this Colony has published a memorandum on the many problems awaiting solution While dealing with Agriculture he has drawn our attention to the very serious position in which, in recent years, the sugar industry here has been placed. A fair nnmber of estates have been pur-

chased by local syndicates. This is very commendable if the owners can be induced to engage in cultivation on a commercial scale and not merely as speculators.

The sugar planters in the past have had many difficult paths to walk. Will the local syndicates be prepared to do the same, and when the price of sugar drops are they likely to spend large sums year after year with little or no immediate return on the money expended? Are they willing to expend money to place their cultivation on a firmer basis than hitherto? Are they keeping abreast of the times and willing to fall into line with changing conditions both in the field and factory? These are questions which should be answered in the affirmative.

I observe that whereas most of the estates owned by so-called absentee proprietors have taken the precaution to engage trained resident chemists on their estates, those owned by local syndicates have not done so. While I do not admit that all of the estates which are so protected by the presence of a chemist, trained either locally or abroad, are carrying out all of the work necessary to a proper chemical control, I know, however, that much financial loss has been prevented.

The application of manure appears to me to be imperfectly understood in many cases and the practice somewhat out of keeping with scientific knowledge. It has long been known that under-manuring of a field is no less harmful than over-manuring and that a proper check can only be kept by making use of the services of an agricultural chemist. I have no doubt that on many estates should the soil be examined (I have read with interest Mr. Bird's work on Pln. Port Mourant in respect to analyses of the soils of that estate) land will be found over-manured and that in many instances the poor yield can be attributed to this error in our chemical control. I write from personal experience of an estate in the colony.

Have the estates' owners thought it worth their while to estimate the probable saving on the manure and labour bills if the manuring was carried out under proper chemical control? The flooding of a field is said to be beneficial, but this I venture to say should never be carried out without the chemical composition of the field having been estimated so as to work out the probable effect of such flooding.

I have been informed that flooding has been condemned by a certain manager as it was found that instead of being beneficial after flooding the yield was actually lower. I have no reason to doubt this, but it is not unlikely that had the manager at his disposal a competent agricultural chemist he would have been informed, providing that manager and chemist worked together, as they should, that the field required an application of either sulphate of ammonia or lime as revealed on analysis, and not flooding which is practised by those requiring the removal of certain harmful alkaline salts which are apt to accumulate after many years of continual cultivation of the sugar-cane in the colony. This is by no means the only reason, as flooding is of importance in the control of soil bacteria notwithstanding the absence of definite and reliable information in regard to their life history.

Then there is also the question of the return to the soil of as much of the organic matter which can with benefit be returned. Also the use of rice straw as a manure, as well as the proper aeration of the soil on which so much of its fertility depends are matters of prime importance and should most certainly receive immediate attention if this large increase in area under cane cultivation is to meet with success. The old habits and customs, such as for example the burning of trash, must go and up-to-date methods under scientific control substituted.

From personal observation I have come to the conclusion that much can be done by way of controlling the percentage of sucrose as polarised. There is not much to be done to improve the actual factory control in this

respect; but are those concerned satisfied that all necessary precautions are taken to ensure a correct reading on the polariscope on many of the estates in the colony? I understand that for every degree below 96·0 on polarisation there is a corresponding loss of 10 cents per bag of sugar. I have no figures to go on but there is reason to believe that on a few estates, the figures handed in by the chemists show readings of 96·2 and on being sent to the Government Laboratory these undergo a very marked change, in many instances a polarisation of 95·7 is recorded.

This is, in my opinion, due in some cases to imperfect knowledge, and in others, indifferent manipulation. Where there is no chemical control how much greater must be the loss I leave those directly concerned to work out.

This careless and indifferent manipulation is not confined to simple polarisation readings but is increased when the analyses of soils, manures, and molasses are considered. Such analyses require not only skill as well as technical knowledge on the part of the chemist but also he has to be certain that the chemicals and solutions with which he carries out these analyses, as regards purity and strength, are proper instruments of control. It can hardly be considered satisfactory to have chemicals and standard solutions supplied by Drug shops in Water street. Grave errors in calculations can be traced in many analyses to standard solutions used not being of the correct strength. It is therefore essential that the preparation of all solutions be under the direct supervision of the chemist concerned.

In reviewing the history of the rise and fall of sugar, the country which has weathered the storm is the one which has always at its disposal, men who are specially trained for their positions, and who are consequently better able to think for themselves and bring to bear their scientific knowledge on the problems of the day.

In Louisiana and elsewhere there are schools especially planned for educating not only the sugar chemist, but a knowledge of practical agriculture, and I use the word in its widest sense, is given to all students. From these schools, Cuba and other sub-tropical countries get their managers, assistants and sugar chemists. In addition a business training in relation to commerce is not overlooked.

Thus men who undertake the management of estates have a thorough knowledge of their work and the same can be said in varying degree of the assistants or overseers as they are called here.

The policy of bringing into the colony as overseers, men who in after years become managers, who have little or no knowledge of agriculture and the many problems which are to be met with locally, is to my mind short-sighted and one not alive to the best interests of Agriculture, and not in keeping with the spirit of the age in which we live.

It is, however, creditable to the planters, in spite of the many disadvantages under which they have laboured, that the results are as good as recorded. My remarks are not intended as a reflection on their efforts in the past but to point out the necessity for a complete change of policy in regard to qualifications for appointments on most of the sugar plantations in the colony.

I remember reading many years ago an address delivered by the late Dr. Deighton, then Principal of Harrison College, Barbados, to the members of an Agricultural Conference, in which he pleaded for the extension of science teaching so that there might be more observers. That is just what is wanted on sugar plantations in this colony. An army of observers who will be able on account of their agricultural training to interpret that which they observe. Interpretation will lead to attemps to solve. Shortly, the manager should have the co-operation of the overseers, in more ways than one, in the working of the estate.

About 1889 Professor Harrison recommended the establishment of an agricultural college, and in the Report of the Royal Commission of 1897 I find that the late Honourable Patrick Dargan supported this suggestion. Had this been done, to-day there would have been spread throughout the West Indian colonies as well as British Guiana, a number of men, who, by virtue of their agricultural experience and knowledge would be alive to the necessity for the blending of Science with Nature so that the best results may be obtained. In its absence we get every now and again the practical man with little or no knowledge of agricultural science giving ever so much attention to improved mechanical means, which are essentials, but do not exhaust the possibilities of an enlightened agricultural policy.

The present Agricultural Apprentices' Training School which has just been enlarged, should prove of great value to planters, providing every inducement is offered to those thus fitted to undertake the duties attached to overseers on estates.

"The Progress Reports" issued by the Director of Science and Agriculture, prove the value of scientific control in the field, and the results recorded are of permanent value to agriculturists.

In addition to the variability of the soil which in tropical and sub-tropical countries is in certain parts very marked, there is also the effect of rainfall on plant growth, a heavy rainfall exercising a certain influence and a prolonged drought being, apart from other considerations, a very important factor when the composition of soil waters with the immediate effect on the soil and the resultant yield per acre are considered.

These are problems which should be carefully investigated, and on each estate when the fact that there are differences in regard to drainage as compared with another is not overlooked, a resident or consulting agricultural chemist should be prepared to devote a larger proportion of his time to research work.

By this means a mass of literature on the subject of scientific control could be got together which in after years will be a guide for future experiments.

In a few words, that increase in sugar production does not depend only on increased acreage under cultivation, or rests alone on improved machinery, but is dependent to a very great extent on the chemical control exercised both in the factory and field. These together will give the *best results* so that in the end the yield per acre in British Guiana will not be lower than those of the successful sugar producing countries. The proposed establishment of Experiment Stations is a very important step on the ladder which leads towards this goal.

BERBICE AS AN AGRICULTURAL DISTRICT.

By Fitz Greeves, Resident Agricultural Instructor.

On entering the County by rail or by road one cannot help being struck with the idea that it is a vast expanse of pasture land or at certain times of the year—after the rice has been reaped—a veritable swamp with a reef of cocoanut palms running through on either side of the railway line.

It is nevertheless an indisputable fact that with the exception of rice, sugar cane and cocoanuts, agriculture is a negligible quantity, and I am convinced that this state of affairs is not due so much to physical inertia as to phenominal difficulties, and I regret to say to a great degree of indifference on the part of the bulk of the people. There are no reasons why things should remain as they are. On the West Coast as well as on the Corentyne coast there are extensive areas of land on which can be grown such crops as sweet potatoes, Indian corn, Guinea corn, pea nuts, yams, pigeon peas and almost all other

ulses. All of these would not only form desirable food or the farmers themselves, but can be grown for exportaion, at a very reasonable profit to the planter. Of the various crops mentioned the only ones which are cultivated are sweet potatoes and maize and these to a very limited extent; not sufficient even for the inhabitants of the district in which they are grown.

One has always to wonder why does such a state of things exist, and the only logical conclusion is that the people living in these parts are either too independent to worry about small things, or that they are too satisfied with their present condition. Of course we must not lose sight of the fact that there is always an excuse for sins of omission and commission on the part of a certain class of people living in some of the villages along the Coasts, and one cannot help feeling that it is wasted energy to try to awaken such individuals to a better and more prosperous state of affairs. To every rule there is an exception, and amongst the farmers on the coasts this obtains. There are some who cannot be classed as being satisfied, but yet have drawbacks. To these we offer our sympathy.

In some of the villages there are not sufficient grounc provisions grown to feed a family of six for a week, and ye year after year we see no effort made to better existin conditions. Is not this self complacency ? On the Coren tyne Coast, at Union and No. 54 Villages, the farme grow nearly all of the crops above mentioned, but onl enough for their own market.

On the banks of the Berbice and Corentyne Rivers better state of things prevails. For although the peo cannot be classed as farmers in the strictest term, yet th do sufficient planting to give them a living of some sort.

Outside of the Sugar Estates tillage is almost unkno You cannot get the farmers to till the land in these pa no matter how much you may try. The reason for thi there is always so much available land of such excellent

tility that no man need do more than a minimum amount of work to get maximum results. The bush is cut and burnt, drains are dug, the land is planted, and after two or three years when weeds begin to grow to any extent the plot is left severely alone as being useless, whereas, with a little tillage, this very land would produce better crops than at first planting. Tillage was all the manuring done in the early ages, and it was not until one farmer discovered that in places where he kept his animals that vegetation flourished more luxuriantly than elsewhere, that farmyard manure was used for the first time.

On the banks of the Canje River there are many small farmers, but amongst them are but a few good ones; the principal work done by people who live in these parts is wood cutting; by this, they earn a fair amount of money in these days, but it is nearly all spent in purchasing, from other districts, foodstuffs that can be grown in most cases on the lands from which the wood has been taken.

Within recent years, there has been a considerable amount of interest displayed, mostly by the large proprietors, in the cultivation of cocoanuts. Extensive areas of young cultivation can be seen on the West Coast at Pln. Phoenix, and at Friends Retreat, as well as on the upper Corentyne Coast. At Pln. Maida there is a large and beautifully planted cultivation with thousands of full bearing trees, free from disease or insect pests. At the time when the price of sugar was so low that the estates could hardly pay their way, the proprietors of the two Plantations on the west bank of the Corentyne River began to divert their attention to some other cultivation, they very wisely planted cocoanuts, and to-day there are at Plantations Skeldon and Springlands thousands of young healthy palms just beginning to bear fruits in an appreciable quantity. In these days when the price of labour, consequent upon the cost of living is so high, it is not difficult to decide whether cocoanuts are a profitable adjunct to the sugar estates. It is unknown in the annals of the history of this colony, that cocoanuts have ever fetched so high a price as they do to-day. The writer has always

termed this cultivation "The farmers' pension", and unceasingly urged the desirability of having these plants to support them in their declining years when they can no longer till the earth. There is always a considerable difference of opinions as to the suitability or otherwise of the soil and the district in which this palm can be grown with success, but from experience and observation, I have come to the conclusion that with drainage and irrigation, along with constant attention, it thrives almost everywhere. Being such a hardy and generous plant, it is generally neglected to an unlimited degree. No one in this colony ever thinks of manuring a cocoanut tree,* which deserves as much care and attention as any other plant. I need not labour the point that with proper care the cocoanut cultivation can be made one of the most paying industries of the colony and I hope the time is not far distant when legislation will be brought to bear more heavily upon people who own these trees, so that the present neglect of this the most profitable and beautiful of all economic fruit trees will be entirely eliminated. At present there are more than three hundred uses for this tree and its fruits—more than can be mentioned of any other known plant in the colony.

From the relics that can be found among the forest trees along the banks of the rivers, cocoa must have been at some time past one of the principal industries of this county. It is now reduced to an almost negligible quantity. On the lower parts of the Berbice and Corentyne Rivers, there are small areas varying in size from one to ten acres still in existence, but most of these for want of better care and attention have been almost fatally destroyed by insect pests and fungoid diseases.

Would I be venturing a visionary statement and one entirely untenable, to believe that with the development of the agricultural possibilities of this county which is so apparent, that the time is not far distant when a serious attempt will be made to make this a more important agricultural centre than either of the sister counties?

* See Board of Agriculture Journal Vol. XII No 1. The advantages through careful cultivation and manuring.

may not be as rich in metals and minerals, but it is wealthy in other resources—if not wealthier—than any her part of the colony. With the bridging of the erbice River, which we hope will be an accomplished fact ithin the next decade, there will be absolutely no reason hy our ambitions cannot be achieved. At present this unty has the lead in cattle rearing, and we are confident at when all the resources of this partly neglected portion British Guiana are developed and brought prominently before the public, Berbice will rank second to none of the other counties.

We live in a progressive age and with the possibilities underlying the soil of this Magnificent Colony, we can hopefully look foward to the time when sugar cane and its by-products will not continue to be the leading agricultural industry.

Let us teach our people that however widely opinion may differ with regard to the comparative fertility of the Hinterland of British Guiana, it is nevertheless a fact established beyond the shadow of a doubt that there is a vast abundance of fertile soil remaining yet unused, and upon which must depend the future prosperity of this as well as the other counties. The dimensions of the colony are undoubtedly colossal; its area stretches over an expanse of hundreds of thousands of square miles, interlaced by a network of noble streams in every direction; the surface of its forests has been enriched with the humus of ages, and here as well as elsewhere in the tropics, the luxuriant profusion of vegetable growths is well caluclated to excite the enterprise of the inhabitants of the colony. At present only comparatively small stretches of cultivation along the coasts and banks of the rivers relieve the primeval rudeness of Nature, so that we can scarcely congratulate ourselves on our enterprise as settlers in a country pre-eminently agricultural. With the exception of sugar cane, rice, and cocoanuts, the area used for other industries dependent on soil cultivation is trivial and all of these compared with the cultivable land of the colony may be regarded as nearly infinitisimal.

BOTANICAL NOTES.

SOME INTERESTING SPECIES OF PALMS.

The "Gru-Gru" *Acrocomia Sclerocarpa*, indigenous; also very common in Trinidad. Although a common palm it is an exceedingly handsome one. Tall growing with a single stem about a foot in diameter, ventricose, with long black spines all over the stem. A handsome head of very fine foliage, the leaves 9-12 feet long, gracefully drooping, the pinnae long and very narrow, arranged on 4 planes, the midrib also covered with long black spines. The inflorescence is borne among the lower leaves; the spadix about 3 feet long, with innumerable simple, wiry branches; a persistent, brown, woody spathe stands behind the spadix. The fruit is yellowish-brown, round, 2 inches in diameter, abundant. The pulp of the fruit and the kernels of the seeds are edible, and a valuable oil is obtained from the latter. Handsome walking sticks are made from the stems.

Dictyosperma from the Mauritian group of Islands, 3 species, *D. rubrum*, *D. album*, and *D. aureum*, all very much alike in their general appearance, differing only in their colouring as indicated by their specific names, and even this is not conspicuous. They are probably the handsomest of the "feather-leaved" palms, with little spread, and so most useful in a collection of decorative palms. The differences to be noticed are in the sheathing leaf-bases, midribs, and in flowering specimens the shades of colouring of the spathes covering the unopened infloresence. In this respect *D. rubrum* is of a reddish brown; *D. album* of a pale grey; and *D. aureum* of a decided yellowish tinge; the green of the foliage also is slightly affected by these shades. Stem single, about 4 inches in diameter. Foliage 9-10 feet long, gracefully drooping; leaflets in 2 rows, regularly 2 inches apart, 2 feet long, pointed, $1\frac{1}{2}$ inches wide. Infloresence below the leaves. The unopened spadix stands up flat against the stem, covered with a flat

parchment—like a spathe with a narrow clasping base, 1 foot 6 inches long, 5 inches wide, exactly the shape of a "Goorka's knife." When the spathe falls, the spadix appears, 12-15 inches long with strong simple branches 12 inches long, spreading 9 or 10 inches. The flowers are msall, yellow. The fruit elliptical 5-8 by 5-16 inch. *Dictyosperma fibrosum.* A very different looking plant to those just mentioned. Stem 3½ inches diameter, single. Foliage slender, 9 feet long; leaflets in 2 regular rows, 2 feet long, 2 inches wide. Inflorescence amongst the leaves, spadix 3 feet long, compound with long slender branches spreading in width as much as length fruit round, 1½ inch diameter. A considerable amount of fine fibrous material is borne in between the leaves and spadices.

Astrocaryum, several species, 4 at least indigenous to Guiana and one to Trinidad. Those of Guiana are unknown in Trinidad, and that of Trinidad is only known in Guiana by being in the Botanic Gardens. One species is very common up the Essequibo River but it has never been grown in the Botanic Gardens, this I believe is *A. Juary*, The "Jarary" palm, forming large long thickets along the sides of the river. *A. Tucuma*, the "Acquero" "Acuyim." "Tucuma," commonly spoken of as "Acquerie" or "Akoorei," which names are also given locally to "Awarra" palm, stem single, 5-6 inches in diameter, bands of black spines between the rings, mixed, 1-3 inches long. Foliage semi-erect 15 feet long. (3 feet stalk.) Stalks and midribs covered with black spines. Leaflets in groups at the base, single further up. 2-2½ feet long 1½-2 inches wide, silvery beneath. Spadices between the lower leaves 4-5 feet long, (half stalk) thorny, branches fine, simple. A persistent narrow, woody spathe remains behind the spadix till it decays. Fruit orange coloured turning grey in drying. Seeds spherical 1¼ inches diameter, brown, streaked all over with black lines, with 3 distinctive eyes from which the black streaks converge.

A. Tucumoides, the "Awarra," "Yawarie." The description given to the previous species applies to a great extent to this one too, but whereas the former species has but one stem this has several, and whether more than one becomes fully developed, there are always suckers growing at the base. The spines on the stems, midribs and spadices are very similar; the foliage is very little if any different, leaflets a trifle narrower, but the fruit is yellow and about half the size of that of its congener, both species have the same markings on the seeds. The fruits of both species are equally sought after and sold in the markets for the pulpy substance covering the seeds. The "Awarra," however, is far more plentiful than the "Acquero."

A. Gynacanthum, The "Black Essetaria." This is another species differing very little from the "Awarra," except that it grows with several fully developed stems not more than 6 inches in diameter with also a quantity of suckers. The foliage is similar in almost every respect, but the leaflets all in groups. The only other difference appears to be that the fruits are smaller than those of the "Awarra." This plant was brought in from the interior by the late Mr. Jenman.

A. aureum, Trinidad. Stem Single. 8 inches in diameter. Long and short spines in wide bands between the rings, Foliage 10-12 feet long (2 feet stalk) stout, semi-erect, leaflets in close groups 2½-3 feet long, 2 inches wide, prickles on stalks and midribs. Spadices amongst the leaves, 3 feet long, (⅓ stalk) with simple wiry branches 3-4 inches long, set close together. Flowers yellow through rusty brown calyces. Fruit yellowish, elliptical, pointed, 1 inch diameter. A persistent woody spathe over the spadix. In the North-West District somewhere near Morawhanna is a very large growing species of Astrocaryum. I have not seen the plant but fruits and seeds were sent to me

and these were at least twice the size of the largest "Acquero" I have seen, these are known there by the name of "Acquyuri."

I once visited Kalacoon many years ago, and there I found a very dwarf species of Astrocaryum, the seeds of which were very small, not more than $\frac{3}{4}$ inch long and $\frac{1}{4}$ inch thick. This and the Morawbanna plants are in all probability the largest and smallest of the genus.

Didymosperma nanum, from Assam and the Khasia Mountains. A rather pretty dwarf palm growing in a clump 6-7 feet high and as much through. Foliage peculiarly pinnate. Stalk slender 4 feet long, remainder 3 feet 6 inches with leaflets at irregular intervals, the first leaflets double, 12-15 inches long, at the half length they are cimeate 4 inches wide, toothed and finely serrate on both sides of centre, the centre prolonged $1\frac{1}{2}$ inches wide, also toothed and finely serrate on both sides and point. Spadices on separate stems with shorter foliage, producing branches from the axil of each leaf, compound, 12 inches long, branches 6-9 inches. Flowers rather small, purplish; fruit purple at first, turning red $\frac{5}{8}$ inch long, $\frac{3}{8}$ inch, wide. Naturally the fruiting stems die off but remain a long time.

Didymosperma distichum from the Sikkim Himalayas. A very different form of plant to that of the preceding species, and although it is interesting in a good collection it is not one that would find favour as a decorative palm. It has but one stem and few leaves—7 or 8—and these arranged distichously like the leaves of the "Travellers tree."

Ravenalia. The stem rather flattened, being 7 inches wide one way and $5\frac{1}{2}$ the other, covered with coarse netted coir. Foliage 12 feet long (3-4 feet being stalk), semi-erect, pinnate. Leaflets in groups of 2-5 at irregular intervals 2-6 inches apart, 2 feet long—those at the top half of the leaf shorter; at the base, long-cuneate spathulate in 2 lengths, deeply notched in the middle

with several smaller notches, points notched and serrated. Inflorescence like that of the Arengas, commencing at the apex. Spadix 3-4 feet long, crowded with simple thick wiry branches about 9 inches long.

—J. F. W.

NOTES ON A COLLECTION OF PRESERVED DRY FRUITS AND SEEDS (Continued).

By J. F. Waby.

Mimosa asperata, of the West Indies. Fruit a revolute whorl of small beans, 3-4 inches across 16 or more in the whorl, the beans a falcate lomentum, $1\frac{1}{2}$-2 inches long, $\frac{5}{8}$ inch wide, a sinus all round, with seeds in separate, constricted compartments between, dark brown with a brown, pilose covering, dehiscing by the sinus breaking away in two strings, liberating the transverse compartments which break away separately. Inflorescence axillary, 2 or 3 globular, rosy pink, stalked flowers at each axil for a considerable length on the young shoots. Foliage bipinnate, alternate, sensitive, 5-6 inches long, with 11-12 pairs of pinnae; pinnulas 30-36 pairs, tiny, linear; a pair of strong recurved spines opposite each leaf, and a small straight spine between each pair of pinnae. Branches reddish brown, a low scrambling shrub. Specimens in Trinidad wild in pastures.

Mimosa sensitiva, cosmopolitan in the West Indies known as "Sensitive plant," "Shame bush," "P'tit Marie." The fruit, a globular collection of tiny pods, an inch across, composed of individual narrow pods $\frac{1}{2}$ inch long, of 3 or 4 seeds, constricted between the seeds having possibly the largest number of pods to be found in such a restricted space. Inflorescence, small pink balls, 2 to each axil. Foliage very fine; stalk $1\frac{1}{2}$-2 inches, with 2 pairs of pinnae—radiating from the apex 1-$\frac{1}{2}$—2 inches long and 15 or 16 pinnules in pairs; exceedingly sensi-

tive, closing at the slightest touch. Short sharp thorns on stems and branches. A low scrambling shrub in pastures.

Dioclea megacarpa, of South America. Fruit, a large bean 7 inches long, $2\frac{1}{4}$ inches wide, $1\frac{3}{4}$ inches thick, slightly constricted between the seeds, falcate, dark brown, with close coruscating curving lines, the whole bean covered with a yellow silky down feeling like the pile of velvet, both sutures very prominent, dehiscent seeds 4, pale brown, with faint dark brown markings, anastomosing like the veins on fern grounds with a clear space brown all round them: the hilum half round pale brown; $1\frac{1}{4}$ inches long and wide by $\frac{1}{4}$ inch thick, each in a separate pocket, the lining of a pale pink colour. Inflorescence a terminal raceme, flowers purplish. Foliage trifoliolate, folioles ovate, 7 inches long, 5 inches wide, veins well marked. A very strong climber. Specimens from Trinidad.

Colvillea racemosa, from Madagascar. Fruit a large brown bean, 9-10 inches long 2 inches wide, dehiscent. Inflorescence in large terminal panicles, 2-$2\frac{1}{2}$ feet long, branches racemose, 6-9 inches long, forming on two sides; flowers brilliant red closely set together on the upper side of the branches. Foliage deciduous, bipinnate, $2\frac{1}{2}$—3 feet long, 19—23 or more sets of pinnae in pairs, 25-35 pinnules in pairs very small. Both foliage and inflorescence very handsome. A medium sized tree. Specimens from Trinidad.

The "Horse-Radish" tree, "Sijun," "Morung," *Moringa pterygosperma*, of India. The fruit a legume-like pod. 12—13 inches long, $\frac{7}{8}$ inch wide, sub-cylindrical, almost triangular, with longitudinal shallow furrows, the ventral suture ridged, slightly constructed between the seeds, dehiscing in 3 valves. Seeds $\frac{3}{8}$ inch diameter, with 3 short gauzy wings, each in a separate compartment. Inflorescence a succession of small panicles, 6 inches long, from the axils of the youngest leaves. Flowers creamy white, foliage

tripinnate, 9 inches long, spreading 6 inches; pinnate in pairs, 2¼-4 inches long; pinnules ovate or obovate, ¾-1 inch long, ¼ inch wide, unequal-sided, dark green above, glaucous beneath. A small loosely branched tree, always to be found where East Indians congregate; these people use the young green pods with curry, and the roots a shorse-radish. A pungent odour pervades the whole tree. Specimens from Botanic Gardens.

Since coming to Trinidad I have added to my collection several notable specimens which I had not met before. *Dioclea magacarpa*, *Enterolobium Timbouva*, and now a very large fruited *Hymenaea*. ("Locust.") What species it is I have not yet been able to determine; but the fruits are so conspicuous as compared with the ordinary "Locust" that it is worth mentioning. The appearance of the tree is very similar to that of *H. Courbaril* the recognised "West Indian Locust," both in general form and foliage, but the fruits are decidedly different; the smaller fruits are of about the same size as the common kind, but not rounded, every fruit is flattened. The larger fruits are oblong in shape with a slanting shoulder, 6-7 inches long, 3 inches wide, 1½ inches thick, the covering quite smooth.

The "Soldier Flower," *Calliandra Guildingii*. Fruit, a solitary curious legume, both sutures prominent, the body of the pod sunk below the sides, shewing plainly 2 or 3 seeds; Sub-falcate, 4½ inches long, ¾ inch wide, dehiscing as soon as ripe with a sharp spring, in 2 valves, curling up. Seeds flat ½ x ⅜ inch. Inflorescence in axillary short corymbs. Flowers 2½ inches long, composed of thread-like filaments, ½ inch of base white, remainder bright crimson like handsome tassels. Foliage furcate, pinnate 5—6 inches long, pinnae in 3 pairs, leaflets unequal sided, the end pair 2½—3 inches x 1¼ inches, the others smaller. A small scrambling tree with irregular knotty branches, Specimens Trinidad.

The largest of this class in my collection is that of *Stereospermum Xylocarpum*, a Bignoniaceous tree of the East Indies. The Pod, 24—27 inches long, 3 inches wide woody, quite thin and flat, dehiscing as soon as ripe in two valves, displaying innumerable flat, very thin, winged seeds, closely packed on a central replum and on each other; the wings being of the finest tissue possible. A straggly-looking, small, deciduous tree with brittle branches, and large triangular, tripinnate leaves, measuring 3 feet long and 2 feet 6 inches wide; 4 pairs of branches and 3 final leaflets; 2 pairs of secondary branches on the 2 first pairs and 2½ final leaflets; leaflets ovate, pointed, 3—4 inches long, 2—2½ inches wide, glabrous beneath all leaflets in pairs except the finals. Inflorescence a strong terminal, close, racemose column, Stalk 12 inches long, the flowers opening one at a time, peculiar gloxinia like, 4½ inches long and about the same in width, throat 1½ inches in diameter, 5 segments to the corolla. Calyx monosepalous, green, 1¼ inches long. The general colouring is of a chocolate brown, the young flowers on opening creamy yellow inside. This plant possesses the largest fruits and the largest foliage of all the Bignoniaceae known to me. Specimens, Trinidad.

The "Grater-pod," fruit of *Jacarandaeclimata*. The pod 9 inches long, 2½ inches wide, 1¾ inches thick, elliptical, covered very closely all over with short blunt spines, light brown when ripe, dehiscing in two valves, looking like shallow pen-trays when fallen. The seeds in great quantity, thin and flat with gauzy wings, arranged closely packed on a central replum. Foliage in opposite pairs, often with a tendril between; leaflets ovoid, 5 inches long 3 inches wide, thin, veins distinct, pale green. Flowers campanulate, 2 inches long, creamy yellow, in short racemes. A slender high climber with long thin branches frequently pendant, often running on the ground among the grass or low bush. On the young growth the foliage is about half the size of that on the mature branches. Pods from Trinidad.

Bignonia (calychlamys) riparia, indigenous. Pods 7 inches long, 3 inches wide, $1\frac{1}{4}$ inches thick, oblong, brown, smooth, of thick woody substance, dehiscing in 2 thick valves, ends of valves turning up sharply. Seeds innumerable with gauzy, pale yellow wings, closely packed on a central replum; spread of wings 3 inches and an inch wide, the seed in the centre small, enclosed in a pithy compartment $\frac{3}{4}$ inch across. Foliage large. oblong, in pairs, often with a tendril between, dark green. Inflorescence in large axillary racemes; flowers large, campanulate, bright yellow with orange lines in throat; the tube $2\frac{1}{2}$ inches long, $\frac{3}{4}$ inch across, mouth of 5 broad segments, $2\frac{1}{2}$ inches across. An all-round yellow calyx $1\frac{1}{2}$ inches long, with 5 deep-toothed points. A very strong climber with stout stems. The character of the stems and branches is that of the "Suple-Jack" pliant, and when the bark is peeled off 4 deep grooves are found in the wood; walking sticks are occasionally seen made from the smaller branches, and in Trinidad gallery chairs are made from them. They bend easily and shew the grooves plainly. Specimens from Botanic Gardens.

Follicles.—These are pods which split down on the ventral suture only, as compared with Legumes which usually split on both. The best known of these are the Sterculias, *S. carthagiensis*, of Tropical America is the principal one in evidence. Follicles 1-4 or 5; before ripening like so many fair-sized pears of a brownish green; when ripe reddish brown, dehiscing wide open,—shewing the seeds on both sides of the suture, black, about $\frac{1}{2}$ inch by $\frac{1}{4}$ inch—4 inches long and as much wide, thick, woody looking like a shallow cup, thickly lined inside by short yellowish stinging hairs, which become detached by rubbing or with age. When the follicles are 3, 4 or 5, they form in regular order like table cruets made for displaying sweets A large deciduous tree with wide spreading branches and heavy looking palmatilobed foliage, with deep clefts, and 5 points, leaves 12-15 inches wide, dark shining green above, velvety beneath, inflores-

cence in axillary panicles produced with the new foliage; flowers unisexual, brownish yellow with purplish spots. Specimens Botanic Gardens.

S. fœtida of the tropics generally, the fruits of this are very similar to those of the last named, except that the colouring is more vivid on the tree, but is lost in the drying. In the flowering and general appearance the tree is also similar, but the foliage is smaller and shining; the colour of the flowers is of a dark reddish brown, and they emit an effluvia as foul as any neglected cesspit, so very few of this species are to be met with.

S. alata from the East Indies. Fruit a brown follicle, pear shaped, 3 inches long and 2 inches wide, dehiscing by the one suture, shewing a quantity of winged seeds closely packed in 2 rows, seeds and wings 1½ inches long, wings nearly an inch broad, papery. A tall-growing, narrow, pyramidal tree; foliage cordate, acuminate, 8 inches long, 5½ inches wide, with prominent ribs, dark green. Inflorescence a terminal panicle. with small dark coloured flowers, unisexual. Specimens from Botanic Gardens.

S. Rupestris, of Australia, the "Flametree." Fruit a single follicle, hard woody, 6 inches long, 2-2½ inches wide, flat at the back, the sides turning inwards to the centre, and splitting down the suture with outturned lips, vaginal. A medium sized tree, pyramidal, with brittle branches. Foliage palmate, 4 inches across, dark green. Inflorescence a fairly large panicle with flaming red flowers. Specimens from Botanic Gardens.

Heritiera littoralis. The "Looking-glass" tree of the East Indies, so called because of the silvery appearance of the back of the foliage. Fruit an indehiscent woody follicle, single or in groups, dark shining brown, of a peculiar triangular form, gouty, with a sharp ridge, (Suture,) pointed, 2—2½ inches long, 2 inches long, 2 inches wide, 1½ inches thick. A medium sized tree with stout rigid branches; foliage elliptical, 6-6½ inches long, 3-3

$\frac{1}{2}$ inches wide, dark green above, silvery beneath, veins prominent. Inflorescence terminal in short panicles; flowers small whitish. Specimens from Botanic Gardens.

Pods which split like follicles but contain seeds with an attached coma:—

Crypstostegia madagascariensis. The "Madagascar" or "Sombiro Rubber" Vine. The fruit is a twin capsule the bases joined, each $3\frac{1}{2}$ inches long, $1\frac{1}{4}$ inches-$1\frac{1}{2}$ wide, triangular, pointed, ribbed longitudinally, leathery, dehiscing by the middle of the upper surface. The seeds are small, black, numerous, each with a flossy silk-like coma, lying flatly packed over each other, encased with a thick, brown, waxen sheath which splits up the centre liberating the seeds. A strong growing climber easily kept in shrub form. Foliage 3-4 inches long, $1\frac{3}{4}$-2 inches wide, oblong, pointed, dark shining green above, very pale beneath. Inflorescence a short terminal panicle; flowers campanulate 2 inches long and the same across the mouth bright mauve coloured. Specimens from Botanic Gardens.

Funtumia elastica. The "Lagos" "Ire," or "Ofruntum Rubber" tree. The fruit, capsules in pairs, each $4\frac{1}{2}$-$5\frac{1}{2}$ inches long, $1\frac{1}{8}$ inches wide, $\frac{3}{4}$ inch thick, spathulate, dehiscent along the upper surface. Seeds many, elliptical, $\frac{1}{2}$ inch long, narrow, brown, each attached to a white silky coma $1\frac{1}{2}$ inches long which opens out like a large pappus. A tall pyramidal tree with loose branches. Inflorescence in axillary fascicles, flowers small, white. Foliage entire, in pairs, oblong, pointed, 6-7 inches long, $2\frac{1}{2}$-$2\frac{3}{4}$ inches wide, edges wavy, dark green above, pale beneath; small glands at base of veins, veins decided, regular, midrib prominent below. Specimens Trinidad.

Stephanotis Floribunda, from Madagascar. Seeds and coma only. The fruit is a succulent capsule, ovoid, green, $\frac{1}{2}$ inch thick, dehiscing along the front, shewing a compact mass of flat, brown seeds attached to a white silky coma opening out to a beautiful fan-shaped pappus. The fruit case shrivels in drying, losing all shape, but the coma is easily preserved and can be effectively used as

ornaments in decorating picture and Christmas Cards, delicate doyleys, etc. The inflorescence is in short axillary corymbs, very floriferous; flowers pure white, highly perfumed, tubular, 2 inches long with lips an inch across. These are very largely used for making wreaths and bouquets. Foliage in pairs, 4-5 inches apart, entire, oblong, leathery, $4\frac{1}{2}$ inches long, $2\frac{1}{2}$ inches wide, dark green above, glaucous beneath, points curved backwards. A strong growing twiner with long trailing shoots. Specimens Botanic Gardens.

BIRDS.

The following is from the Report for the year 1918 of the Royal Society for the Protection of Birds just to hand :—

" .... Man does not live by bread alone. The call to protect birds would be scarcely less imperative though their diet were innocent of caterpillar and fly, weed-seed and vermin. As a part of creation possessing infinite interest for the student of nature and science, as the most beautiful and most musical of earth's little people, as beings whose lives and loves and intelligences link them with ourselves in the mysteries of physiology and psychology, birds must ever claim protection at the hands of man as surely as they contribute to the purest and truest of his pleasures. Absolute as is the need for their services to the husbandman, it is not as insect-eating machines that they appeal to the men and women who know, and, knowing, love them; but rather as fascinating and elusive companions, constant neighbours and willing friends on the one hand, and, on the other, embodiments of that wild free nature of which so little remains in these crowded islands, joyous and exhilarating in their franchise of earth and sea and air. The feeling of the soldier who has fed a robin in the trenches or has heard a lark singing over the battlefield, may be more to the purpose than the pronouncement of the able man of science who can speak favourably of a species after examining crop-contents in a laboratory ...."

ANALYSES OF FRUITS AND SEEDS.

The following interesting analyses of various well known fruits and seeds have been extracted and translated from a Bulletin on the subject published by Dr. J. Sack in Paramaribo, Dutch Guiana.—Editor.

Scientific Name.	Popular Name.	Part examined.	Percentage of water.	Percentage of Fat.	Percentage of Oil.	Iodine Number.	Saponification Number.	Reichert Meissel Number.
		Palmae.						
Mauritia flexuosa. Linn.	Ita Palm.	Flesh of fruit	64	0·8	...	...	...	...
		Kernel.	46	0·1	..	19	241	...
Manicaria Saccifera. Gartn.	Troolie Palm.	Kernel.	54	8	..	75	192	...
Oreodoxa Regia. H.B.K.	Royal Palm.	Flesh of fruit.	56	9	..	77	198	1·7
		Kernel.	30	10	10			...
Euterpe Oleracea. Mart.	Euterpe.	Flesh of fruit.	37	1·4	24	80	200	...
		Kernel.	16				..	...
Oenocarpus Batana. Mart.	..	Flesh of fruit.	41	0·8		58		..
		Kernel.	34	9		17		..
Maximiliana Maripa. Drude.		Flesh of fruit	36	54		17·5 Triolein		
		Kernel.	17	4	Fat contains	82·5 Trilaurin		
Acrocomia Sclerocarpa. Mart.	...	Flesh of fruit.		25				
		Kernel.		0·5		14	257	4·8
Astrocaryum Paramaca. Mart.	..	Flesh of fruit.	46	24		70	197	1·1
		Kernel.	42		12	17	238	2
Astrocaryum segregatum Drude.	Awarra.	Flesh of fruit.	44	29	...	15	238	...
		Kernel.	23	40	..			
Bactris acanthocarpae. Mart.	..	Kernel.	9					..
	..	Kernel.		35	Fat contains	12·6 Triolein; 86·4 Trilaurin		
Bactris Minax. Miq.		Kernel.	..					
		Zingiberaceae.						
Renealmia exaltata. Linn.	..	Seeds.	34	..	7			
		Anonaceae.						
Anona muricata. Linn.	Soursop.	Fruit flesh.	87	0·3	17	92	191	..
		Seeds.	41	...				

ANALYSES OF FRUITS AND SEEDS.—(*Contd.*)

Scientific Name.	Popular Name.	Part examined.	Percentage of water.	Percentage of Fat.	Percentage of Oil.	Iodine Number.	Saponification Number.	Reichert Meissel Number.
Solanum melanogena. Linn.	Boulanger.	Fruit flesh. Seeds.	94 23	0.3 ...	.. 9	.. 159	. 188	... 0 9
		Bignoniaceae.						
Crescentia Cujete. Linn.	Calabash.	Seeds.	18	...	22	78	190	...
		Rubiaceae.						
Randia formosa. Jacq. U. Schum.	...	Seeds.	30	1·5	..	...	...	..
Ixora coccinea. Linn.	Ixora.	Seeds.	21·0	...	18	133	194	...
Coffea Arabica.	Arabian Coffee.	Seeds.	46	6	..	85	170	1·0
Coffea liberica.	Liberian coffee.	Seeds.	47	6·5	..	90	181	1·7
Coffea robusta.	Robusta coffee.	Seeds.	49	2·0	..	86	186	2·
		Cucurbitaceae.						
Citrullus Vulgaris Schrad.	Water Melon.	Seeds.	25	..	20	126	192	0·9
Cucurbita Pepo. Linn	Pumpkin.	Seeds.	30	..	18	97	190	...

ANALYSES OF FRUITS AND SEEDS.—(Concld.)

Scientific Name.	Popular Name.	Part examined.	Percentage of water.	Percentage of Fat.	Percentage of Oil.	Iodine Number.	Saponification Number.	Reichert Meissel Number.
		Passifloraceae.						
Passiflora foetida. Linn.	Wild Semiton	Seeds.	...	...	20	125	197	1·0
Passiflora laurifolia. Linn.	Water Melon.	Seeds.	42	14	...	114	206	0.4
		Caricaceae.						
Carica Papaya. Linn.	Papaw	Fruit flesh.	87	0·4	...	...	...	...
		Seeds	38	...	20	70	193	0·9
		Punicaceae.						
Punica Granatum Linn.	Pomegranate.	Seeds.	13	...	15	155	192	...
		Myrtaceae.						
Psidium Guyava. Raddi.	Guava.	Fruit flesh.	82	0·5	...	...	...	...
		Seeds.	17	...	8	139	189	...
Jambosa vulgaris. D.C.	Rose Apple	Fruit flesh.	90	..	...	...	...	...
		Seeds	52	1.0	...	...	...	...
		Sapotaceae.						
Achras Sapota. Linn.	Sapodilla.	Fruit flesh.	79	1·5	...	...	...	...
		Seeds.	30	10	...	68	192	...
Chrysophyllum Cainito. Linn.	Star Apple.	Seeds.	39	19	...	59	188	...
		Solanaceae.						
Solanum mammosum. Linn.	Macaw Bush.	Seeds.	15	...	12	139	185	0·9
Solanum Surinamense. Sendt.	..	Fruit flesh.	94	0·4	...	...	...	...
		Seeds.	50	16	...	140	186	0·2

THE WILD BIRDS PROTECTION ORDINANCE.

The Wild Birds Protection Ordinance which first came into force in 1887 has recently been repealed and another Ordinance issued in which there are certain alterations which, for the benefit of the agricultural community, may briefly be noted here.—Editor.

"The close season" means the period between the first day of April and the first day of September in each year, or such other period as may from time to time be declared to be the "close season" by order of the Board of Agriculture in accordance with the provisions of this Ordinance.

Every person who—

1. Knowingly *captures,* wounds or kills any wild bird specified in the *First Schedule* to this Ordinance; or
2. Exposes or offers for sale, or knowingly has in his possession or exports or attempts to export from this Colony any wild birds or part of such wild bird captured or killed after the commencement of this Ordinance

shall be guilty of an offence, and, being convicted thereof, shall be liable to a penalty of twenty-four dollars for each wild bird or part thereof in respect of which the offence is committed.

Every person who—

1. Knowingly *captures,* wounds or kills any wild bird specified in the *Second Schedule* to this Ordinance during the close season; or
2. Exposes or offers for sale, or purchases any such wild bird recently captured or killed during the close season

shall be guilty of an offence, and, being convicted thereof, shall be liable to a penalty not exceeding twenty-four dollars for each wild bird in respect of which the offence is committed.

SCHEDULES.

THE FIRST SCHEDULE.

LIST OF WILD BIRDS ABSOLUTELY PROTECTED.

Ant Thrushes and Bush Shrikes (*Formicariidae*).
Babbling Thrushes (*Mimidae*).
Barbets (*Bucconidae* and *Capitonidae*).
Bunyas, Mocking Birds and Robins (*Icteridae*) except Rice Birds (*Cassidix oryzivora*).
Cormorants (*Phalacrocoracidae*).
Cotingas (Wallababa and allies (*Cotingidae*).
Cuckoos (Old Witches and allies) (*Cuculidae*).
Ducklars (*Plotidae*).
Falcons and Hawks (*Falconidae*).
Finches (Grass Birds and allies) (*Fringillidae*).
Fin-foots (*Heliornithidae*).
Flamingoes (*Phaenicopteridae*).
Frigate Birds (*Fregatidae*).
Gannets (*Sulidae*).
Goatsuckers (Who You, Wakario and allies) (*Caprimulgidae*).
Grebes (*Podicepedidae*).
Ground Doves (*Peristeridae*).
Herons or Gaulings, Quacks, Chows and allies (*Ardiedae*).
Hoatzins or Canje Pheasants (*Opisthocomidae*).
Humming Birds (Doctor Birds and allies) (*Trochilidae*).
Jacamars (*Galbulidae*).
Jays (*Corvidae*).
Kingfishers (*Alcedinidae*).
Manakins (*Pipridae*).
Motmots (Houton and allies) (*Momotidae*)
Owls (*Bubonidae and Strigidae*).
Pelicans (*Pelecanidae*).
Petrels (*Procellaridae*).
Rails and Crakes (Blue hens, Killicow and allies) (*Rallidae*).
Screamers or Mahonka (*Palamedeidae*)
Sugar Birds (*Coerebidae*).

Sun Bitterns or Sun Birds (*Eurypygidae*).
Swallows (*Hirundinidae*).
Swifts (*Cypselidae*).
Tanagers (Sackies and allies) (*Tanagridae*).
Terns and Gulls (*Laridae* and *Stercorariidae*).
Thrushes (*Turdidae*).
Toucans or Bill Birds (*Rhamphastidae*).
Trogons (*Trogonidae*).
Tyrant Shrikes (Qu'est quil dit, Muff Bird, Kiskadee and allies) (*Tyrannidae*).
Vireos and Greenlets (*Vireonidae*).
Vultures (Carrion Crows and allies) (*Carthartidae*) except in towns or villages.
Warblers (Peas tree Canary) (*Mniotiltidae*).
Woodhewers or Creepers (*Dendrocolaptidae*).
Woodpeckers (Carpenter Bird and allies) (*Picidae*).
Wrens (God Birds and allies) (*Troglodytidae*).

THE SECOND SCHEDULE.

LIST OF WILD BIRDS PROTECTED DURING CLOSE SEASON.

Caraows (*Aramidae*).
Ducks (*Anatidae*), except in the rice fields.
Ibises, (Curri-curri and allies) (*Ibididae*).
Maams and Tinamus (*Tinamidae*).
Parrots and Macaws (*Psittacidae*).
Pigeons (*Columbidae*).
Plovers and Snipes (*Charadriidae*).
Powis and Marudis (*Cracidae*).
Spoonbills (*Plataleidae*).
Spur-wings (*Parridae*).
Storks (Negro cop, Heeri and allies) (*Ciconiidae*).
Thick-kneed Plovers (*Oedicnemidae*).
Tooth-billed Partridges, (Duraquara and allies) (*Odontophoridae*).
Warracabas (Trumpet Birds and allies) (*Psophidae*).

W. C. A. ASSOCIATION.

The W. C. A Association has held its meetings regularly under the presidency of the Rev. W. A. Deane, Hon. Secretary; Mr. A. D. Hack, President, being absent. Much has been done during these five months: The Agricultural Board gave us an affiliation grant. Interesting cane-farming meetings were held with the happy result that Plns. Uitvlugt and Leonora opened widely their doors of kindness to the people, some of whom have taken up cane-farming. Between the two estates many East Indians and Negroes have taken up about one hundred acres, Messrs. Strang and Anderson, Managers and Attorneys giving the farmers fortnightly monetary advance. We must thank the authorities of these estates for their extra goodness. We hope our people will seize this golden opportunity of bettering their position. The Rev. W. A. Deane and a Mr. Chas. Schmidt from Trinidad did all they could to encourage the people back to the soil.

MEETING OF THE BOARD OF AGRICULTURE.

A special meeting of the Board of Agriculture was held at the offices of the Board, Broad Street, on Friday, April 11th; His Excellency the Officer Administering the Government presided.

SELECTION OF DISTRICT AGRICULTURAL INSTRUCTOR.

The Chairman reported that Mr. J. M. Cush had been appointed as Instructor to the West Coast Berbice District. Mr. Cush had been employed by the United States Department of Agriculture and appeared to be a most suitable person.

ANNUAL LIVE STOCK SALE.

Professor Harrison reported that the prices realised at the Annual Live Stock Sale were distinctly poor. In a number of instances no bids were received with the result that the animals were left on the auctioneer's hands. The total amount realised was $1,564.18.

WEST BANK AGRICULTURAL SHOW.

It was reported that an application had been received from the West Bank Agricultural Society asking permission to hold a show in August.

Mr. Earle stated that he was opposed to holding the show at that time owing to the recent floods which had caused much damage in the Canal Districts. He suggested October as the better month. Considerable discussion then took place as the President of the West Bank Agricultural Association was present and strongly supported the holding of the show in August.

It was evetually decided to hold the show in August.

RABIES AND THE IMPORTATION OF DOGS.

Owing to the outbreak of Rabies in Europe the Board decided to prohibit the importation of dogs into the Colony. The necessary order was then made and carried unanimously.

This being all the business the President adjourned the meeting *sine die.*

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the first nine months of 1919. The corresponding figures for the two previous and the average for the four years previous to that are added for convenience of comparison.

Product.	*Average 1913-16.*	*1917.*	*1918.*	*1919.*
Sugar, tons ...	51,402	73,507	64,427	43,583
Rum, gallons	2,425,984	2,736,829	2,016,173	3,438,593
Molasses, gallons	39,850	87,140	28,186	171,247
Cattle-food, tons	2,079	1,825	1,876	1,112
Cacao, cwts. ...	368	70	85	85
Citrate of Lime, cwts.	139	129	27	306
Lime Juice, gals.	No records	10,727	11,390	6,663
Essential Oil of Limes, gals.	No records	219	162	291
Coconuts, thousands	1,180	1,523	824	3,040
Copra, cwts. ..	1,346	817	2,010	1,602
Coffee, cwts. ..	2,117	2,273	2,924	7,933
Kola-nuts, cwts. ...	7	None	24	None
Rice, tons ...	6,489	12,674	7,963	3,158
Ricemeal, tons ...	586	140	66	None
Cattle, head ...	*648*	*723*	*306*	*1*
Hides, No. ...	3,594	1,281	2,263	5,369
Pigs, No. ...	1,012	455	None	None
Sheep, head ...	40	18	10	None
Balata, cwts. ...	7,707	5,932	3,628	4,999
Charcoal, bags ...	46,030	34,708	29,054	33,020
Firewood, Wallaba, etc., tons ...	7,132	6,274	5,233	5,939
Gums, lbs. ...	821	112	60	2,001
Lumber, cub. ft. ...	271,046	123,125	92,530	179,237
Railway sleepers, No.	4,531	30,013	6,510	2,008
Rubber, cwts. ...	34	96	142	79
Shingles, thousands	1,717	2,172	2,009	1,932
Timber, cub. ft. ...	196,788	24,992	8,026	98,303
Coconut Oil, gals. ...	No records	20,986	23,112	6,371

ATTENDANCES AT THE DISTRICT GARDENS

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	718	21,729
1913 ...	5,156	4,535	2,519	3,399	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,200
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,886
1918	4,834	3,081	1,653	2,671	2,162	2,790	2,067	19,258
1919								
1st Quarter	965	626	256	749	450	639	515	4,200
2nd Quarter	1,174	650	721	766	427	614	343	4,695
3rd Quarter	1,043	424	343	489	379	517	200	3,395

Meteorological Data—July–September, 1919.

Months.	Rain-fall. Inches.	NUMBER OF DAYS OF RAIN: Under ·10 Inches	·10 to ·50 Inches	·50 to 1.00 Inches	1.00 to 2.00 Inches	Above 2.00 Inches	Total days	EVAPORATION Inches	Air Temperature and Humidity. Air Temperature: Maximum	Minimum	Mean	Hdty. Mean
Botanic Gardens												
July ...	7.71	7	9	4	1	.	21	4.65	85.2	75.3	80.2	78.4
August ...	5.57	5	8	2	1	.	16	4.85	86.2	75.3	80.7	81.4
September	1.53	6	2	1	.	.	9	5.93	87.7	76.0	81.8	77.5
Totals & Means	14.81	[illegible]	19	7	2	.	46	15.43	86.3	75.5	80.9	79.1
Onder-neeming												
July ...	7.77	3	5	4	2	.	14		86.0	75.3	80.6	86.8
August ...	5.51	2	5	3	1	.	11		89.0	79.3	84.1	82.3
September	5.24	2	4	2	2	.	10		89.2	77.2	83.2	88.6
Totals & Means	18.52	7	14	9	5	.	35		88.1	77.2	82.6	85.9
Mora-whanna												
July ...	21.46	5	10	3	3	5	26					
August ...	12.53	3	14	2	5	.	24					
September	6.67	5	12	3	1	.	21					